MARINE REVIEW

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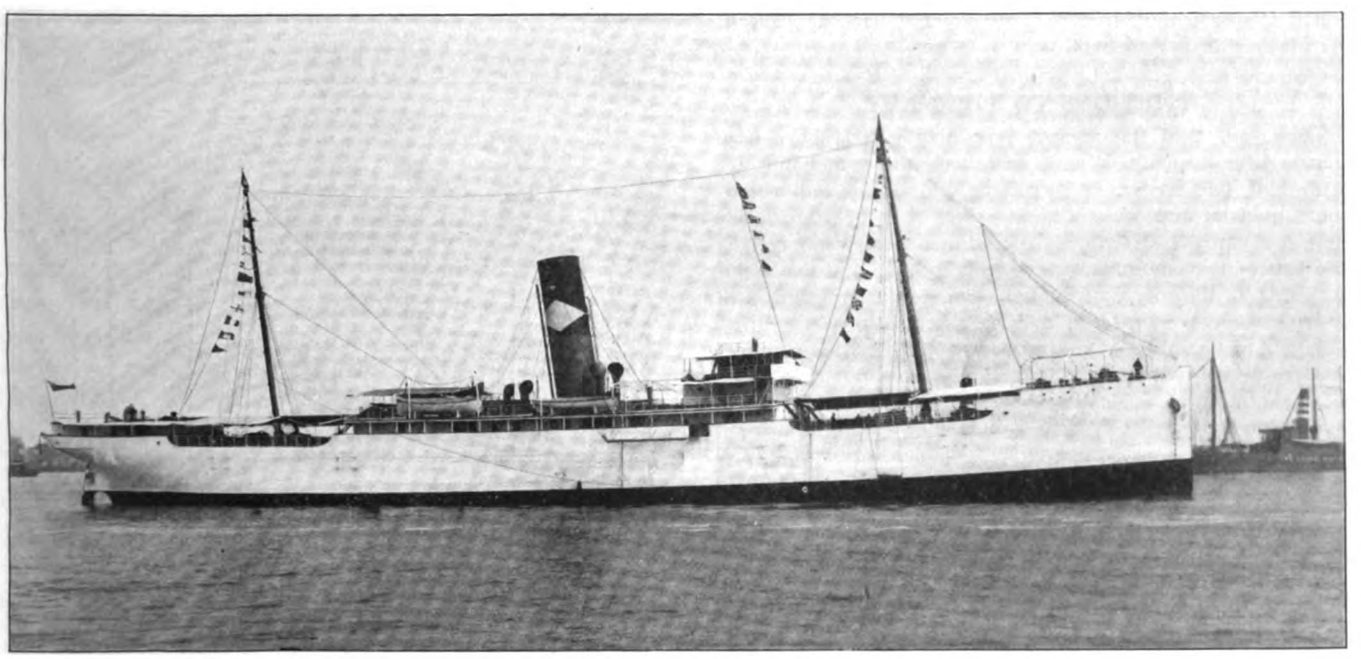
## NEW BATTLESHIPS AND ARMORED CRUISERS

The bureau of construction and repair has completed the circular defining the chief characteristics of the 16,000-ton battleship New Hampshire and the two 14,500-ton armored cruisers North Carolina and Montana authorized by congress last April. Bids are now being solicited for the construction of these vessels and will be opened by the bureau Dec. 15. In considering the bids submitted the department will, other things being equal, give preference to the ship yard that guarantees the shortest time for completion. The New Hampshire is to attain a speed of 18 knots on her trial and if she falls below 17½ knots she will not be accepted. The sum of $100,000 will be deducted from the contract price for every quarter knot deficiency below 18 knots. In the case of the armored cruisers they are expected to make 22 knots and will not be accepted if they make less than 21½ knots. The same penalty per quarter knot attaches to any failure to reach the required speed of 22 knots.

The general dimensions and features of the New Hampshire are as follows: Length on load water line, 450 ft.; breadth extreme at load water line, 76 ft. 10 in.; displacement on trial, 16,000 tons; mean draught bottom of keel 24 ft. 6 in.; total bunker capacity, 2,350 tons. The main battery is to consist of four 12-in. breech-loading rifles; eight 8-in. breech-loading rifles; twelve 7-in. breech-loading rifles and four submerged torpedo tubes. The second battery is to consist of twenty 3-in. 14-pounder rapid firing guns; twelve 3-pounder semi-automatic guns; four 1-pounder semi-automatic guns; two 3-in. field pieces; two machine guns of .30 caliber and two automatic guns of .30 caliber. The 12-in. guns are to be mounted in pairs in two electrically controlled, balanced, elliptical turrets on the center line, one forward and one aft, each with an arc of fire of about 270°. The 8-in. guns are to be mounted in pairs in four electrically controlled, balanced elliptical turrets, two on each beam at each end of the superstructure. The 7-in. guns are to be mounted in broadside protected by 7-in. armor, the forward and after guns being arranged to fire right ahead and right astern respectively. The hull is to be protected at the water line by a complete belt of armor, 9 ft. 3 in. wide, having a uniform thickness of 9 in.



STEAMER SAN JOSE, THE LATEST ADDITION TO THE FLEET OF THE UNITED FRUIT CO OF BOSTON.

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for about 280 ft. amidships, gradually decreasing to 4 in. at the stem and stern. A complete protected deck will extend from stem to stern.

The armored cruisers North Carolina and Montana are of the following dimensions: Length on load water line, 502 ft.; breadth extreme at load water line, 72 ft. 10½ in.; displacement on trial, 14,500 tons; mean draught, bottom of keel at trial displacement, 25 ft. Their main battery is to consist of four 10-in. breech-loading rifles, sixteen 6-in. breech-loading rifles; twenty-two 3-in. rapid-fire guns; eight 4-in. submerged torpedo tubes. The secondary battery is to consist of twelve 3-pounder semi-automatic guns; four 1-pounder semi-automatic guns; two .30 caliber machine guns; two .30 caliber automatic guns and two 3-in. field guns. The 10-in. guns are to be mounted in pairs in two electrically controlled balanced elliptical turrets on the center line, one forward and one aft, each with an arc of fire of about 270°. The 6-in. guns are to be mounted four independent casements on the main deck and the remainder on broadside on the gun deck, all on pedestal mounts, those on the gun deck being behind 5-in. armor. The hull will be protected by a water line belt of armor worked in vertical strakes amidships where it will be about 18 ft. in height extending from the protective deck to the gun deck port sills, being stepped down at the ends. The armor is to be of uniform thickness of 5 in. throughout in machinery and magazine space and 3 in. forward and abaft this. There will be a complete protective deck extending from stem to stern, the deck being flat amidships but sloped at the sides throughout and also at each end.

The propelling machinery of the New Hampshire and the North Carolina and Montana were described in the issue of the Marine Review of Sept. 29.

## ADDITIONS TO THE NAVY

Since Jan. 1 of the present year nine vessels have been launched for the United States navy. Of these nine four are battleships, two are armored cruisers, one a protected cruiser, one a gunboat and one a training ship. By the end of this week five more vessels will have been launched. They include two battleships, one gunboat, one training ship and one training brig. In the course of the next two months two more will be launched, one a battleship and the other a protected cruiser. This will make a total of sixteen vessels of all classes launched this year. This would be a remarkable showing but for the fact that most of the ships are away behind contract time. The following is a list of ships launched according to classes: Battleships Louisiana, Connecticut, Rhode Island and Virginia, armored cruisers California and South Dakota, the protected cruiser Charleston, the gunboat Dubuque and the training ship Cumberland. Last week and this the battleships Nebraska and Georgia, the gunboat Paducah and the training ship Intrepid and the training brig Boxer were launched. The remaining two ships to be launched this year are the battleship New Jersey and the protected cruiser Milwaukee. Four vessels have been added to the commissioned force of the navy since Jan. 1. They are the battleship Ohio and the protected cruisers Denver, Des Moines and Tacoma. In a week the protected cruiser Chattanooga will be added.

## ABANDONED OIL AS FUEL

Notwithstanding the entire practicability and safety of oil as fuel on steam vessels have been clearly and satisfactorily demonstrated yet it would appear that the traveling public is not quite prepared to accept the verdict. It was announced some time ago by the officials of the Pacific Coast Steamship Co. that it had determined to convert all their steamers into oil burners. The company had already gone so far as to install on the steamer (at a heavy expense) Coos Bay, a complete oil-burning plant. The Coos Bay plies regularly between San Francisco and Southern California ports. Now the Pacific Coast Steamship Co. has just decided to abandon the oil-fuel scheme on their line. This revocation of the former plan is very largely due, it is said, to the general objections raised by passengers who feel some timidity about traveling on steamers using oil as fuel. It is considered decidedly strange that this company should find oil fuel impracticable when a majority of the steamers (large as well as small) plying coastwise are using that material, and in no instance has it been found deficient. Only two severe disasters from oil explosions are to be recorded on the Pacific coast. One was the fearful explosion on the iron steamship Progresso about two years ago; the other that of the George B. Loomis very recently at Portland, Ore.

## SHIP CONSTRUCTION IN THE UNITED STATES

While more vessels were built in the quarter ended Sept. 30 last than were built for the corresponding quarter last year yet they were smaller far for the tonnage was only 40,374 as against 66,023 for the corresponding quarter. The bureau of navigation reports 328 vessels of 40,374 tons were built during the quarter classified and distributed as follows:

| | Wood. | | | | Steel. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | Sail. | | Steam. | | Steam. | | | |
| | No. | Gross. | No. | Gross. | No. | Gross. | No. | Gross. |
| Atlantic and Gulf | 105 | 21,766 | 74 | 2,947 | 15 | 8,472 | 194 | 33,185 |
| Porto Rico | 2 | 22 | .... | .... | .... | .... | 2 | 22 |
| Pacific | 13 | 2,449 | 41 | 2,050 | .... | .... | 54 | 4,499 |
| Hawaii | .... | .... | .... | .... | .... | .... | .... | .... |
| Great Lakes | 10 | 126 | 13 | 257 | 4 | 409 | 27 | 792 |
| Western Rivers | .... | .... | 51 | 1,876 | .... | .... | 51 | 1,876 |
| Total | 130 | 24,363 | 179 | 7,130 | 19 | 8,881 | 328 | 40,374 |

During the corersponding quarter ended Sept. 30, 1903, 310 vessels of 66,023 gross tons were built as follows:

| | Wood. | | | | Steel. | | | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sail | | Steam. | | Sail. | | Steam. | | | |
| | No. | Gross. | No. | Gross. | No. | Gross. | No. | Gross. | No. | Gross. |
| Atlantic & Gulf | 87 | 10,422 | 82 | 4,631 | 1 | 3,248 | 8 | 2,208 | 178 | 20,509 |
| Porto Rico | 1 | 7 | .... | .... | .... | .... | .... | .... | 1 | 7 |
| Pacific | 9 | 1,972 | 34 | 5,095 | .... | .... | 1 | 484 | 44 | 7,551 |
| Hawaii | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Great L'k's | 3 | 36 | 28 | 649 | .... | .... | 14 | 33,917 | 45 | 34,602 |
| Western Rivers | .... | .... | 42 | 3,354 | .... | .... | .... | .... | 42 | 3,354 |
| Total | 100 | 12,437 | 186 | 13,729 | 1 | 3,248 | 23 | 36,609 | 310 | 66,023 |

On the recommendation of the general board of the navy department the board of construction and repair has been requested to draw plans for a battleship, which will carry twelve heavy turret guns of not less than 10-inch caliber, at least four of which shall be 12-in. and secondary batteries of not more than 3-in. guns. It is expected that this type, if found practicable, will be adopted for the next battleship authorized by congress. This is one of the suggestions conveyed by the Russian-Japanese war, where it appears that most of the guns save the heaviest and the lightest have proven inefficient.

Commodore Morton F. Plant of the Larchmont Yacht Club has returned from England, where he went to witness the races of his schooner yacht Ingomar. Commodore Plant comes back with nineteen prizes out of twenty-four races, twelve firsts, four seconds, one third and two specials. Altogether Ingomar won twenty-one cups, which established the foreign record upon the American yacht of any size. Commodore Plant saw Sir Thomas Lipton while abroad but had nothing to say regarding any further contest regarding America's cup.

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## RAFTING ON THE ST. LAWRENCE

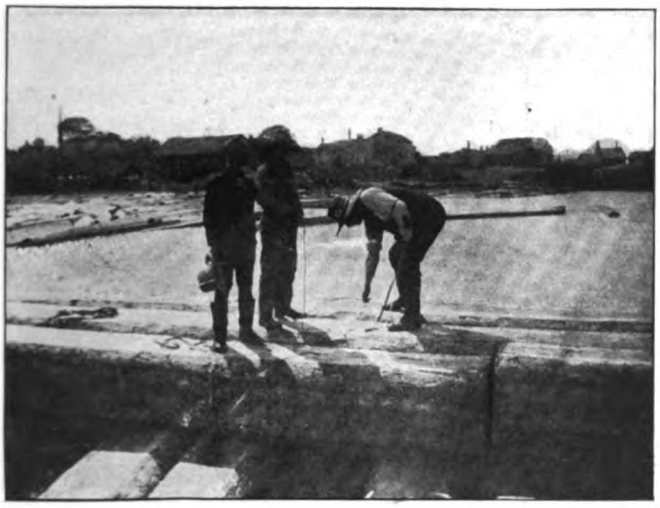
CASCADE RAPIDS FROM THE STERN OF THE DRAMS.

Although the timber industry of the great lakes has greatly declined during the past twenty-five years, great quantities of pine, oak and elm are still shipped for export to Great Britain. Steam barges and tow barges bring the timber from Toledo, Saginaw, Garden river, Spanish river, Port Arthur, Charlevoix, Grand Marias and Toronto, down to the head of the River St. Lawrence—at Garden Island and there it is rafted down to Quebec. The Calvin Co., Ltd., of Garden Island (Mr. H. A. Calvin, M. P., senior member of

LOADING A PINE DRAM, PLACING THIRD TIER.

firm), is now the only firm that rafts timber from the great lakes.

Rafting is a business which requires a great amount of special apparatus and material for its successful prosecution, as well as long experienced mariners for safely guiding the rafts to their destination. In time gone, though not the past



EVERY STICK IS REMEASURED BY WILLIAM MARTIN AND ASSISTANTS AFTER BEING LOADED ON.

two decades, rafts have been wrecked and many thousands of dollars lost. It is said that enough oak timber lines the bottom of the St. Lawrence river to build a navy; but outside of an occasional dram getting ashore and breaking up, or a few sticks breaking away, scarcely any is now lost.

The process of preparing the raft, like many others, has

WITHING UP—THE METHOD OF TWISTING THE WITHE BY THE TOGGLE.

gradually evolved itself from crude methods, by means of observed experience and labor-saving machines. The materials for the construction of a raft are floats, binders, toggles, withes, pickets, row-locks and wedges. A crib is made of three hemlock or ash floats about 60 ft. long, set about 30 ft. apart and connected across with six tamarack binders, secured by wedged pickets. These cribs are launched and five or six of them attached together to make a dram. The timber is

THE RAFT GOING DOWN THE ST. LAWRENCE.

then floated in between the floats, care being taken to match the lengths so the ends may come out fairly even. About two inches of space is left between all the timber to allow for the insertion of the withe, which encircles the stick and the binder. The withes have been previously twisted and crushed to make them pliable almost like a rope, yet stronger. The two ends of the withe are fastened together with a bight and then twisted tight with a toggle, the end of which is secured by the next withe and chopped off.

The oak draws have one tier of timber, the elm two, and the pine three. Generally five to seven draws make up a raft,

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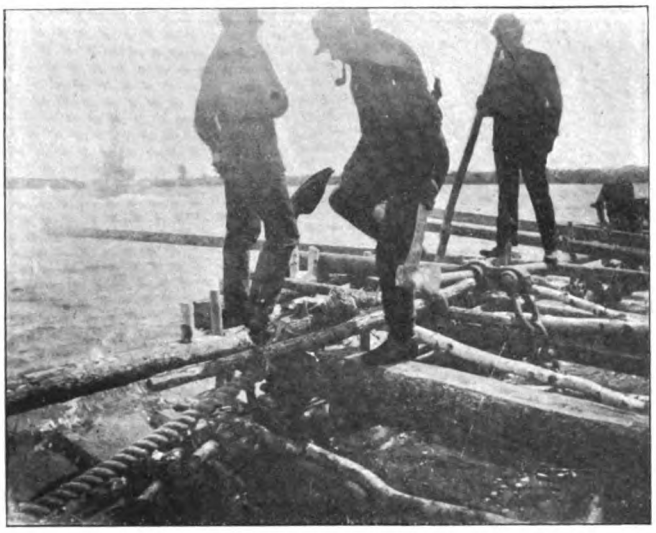
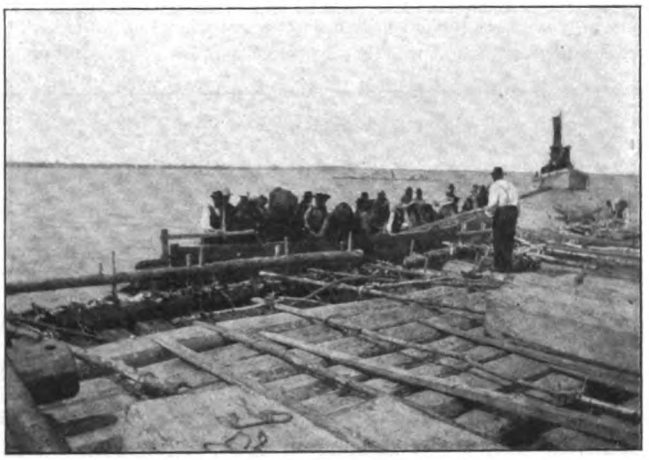
though before the days of towing as many as nine to twelve draws were put in a raft. The draws are 235 ft. by 60 ft., contain from 15,000 to 35,000 cu. ft. of timber, the total value of a raft ranging from $50,000 to $200,000.

The rafts are towed by a tug at from 2 to 2½ miles per hour



GETTING READY TO ANCHOR THE RAFT. WIND TOO STRONG TO RUN THE LACHINE.

on the level. When wind is fair they hoist the sails, taking from five to eight days for the voyage to Quebec, according to the winds and success. The rapids to be encountered all lie between Prescott and Montreal—the Gallops, Long Sault, Coteau, Cedars, Cascade and Lachine, and in the descent of



THE PILOTS AND EXTRA MEN LEAVE THE RAFT AT THE FOOT OF THE CASCADES IN THE "BATTEAU."

these, with the single exception of the Gallops, the raft has to be separated into drams, and each dram manned with a crew of ten to twenty oarsmen and a pilot.

The commander of the St. Lawrence rafting is Monsieur Amey Guerin of Garden Island, an old long-experienced French-Canadian raft-mariner, thoroughly conversant with every eddy, current and shoal from the Spectacles to Cape Diamond. In separating and connecting the drams, entering the rapids, and securing the courses, and anchoring against the wind, and "Amey's" voice can be heard above the roar of water and wind, and men and pilots of thirty years' experience obey him with the greatest speed. Although over seventy years of age he has yet all the energy of his younger days. When things go wrong, he yells at the men, throws his arms in the air, doubles his fists and shrieks French curses; he is

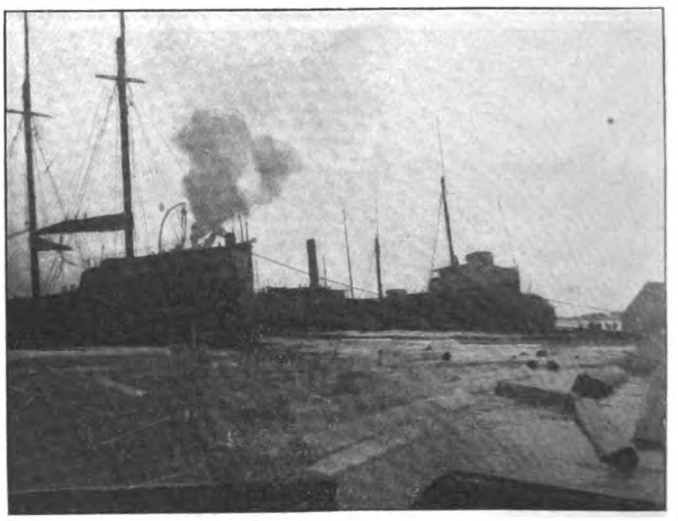
CONNECTING THE DRAMS AFTER THR DESCENT OF THE RAPIDS.

really a picturesque figure commanding the welfare of his raft.

"Cainbin a taire!" one can hear him yell, "ancore cou, an-

UNLOADING THE HOLD FROM BOTH PORTS.

core! ancore! bonte de moudi." When nearing the "Marmite" (— boiling kettle), the eddy which marks the raft channel to enter the Cascades, "Boute de moudi! toute ensemble, sacre



GARDEN ISLAND HARBOR. UNLOADING PINE TIMBER FROM BARGES.

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moudi! leetle more!" can be heard above all roars of the approaching rapids.

If the wind is north or south the raft has to tie up and wait. Extra gangs of men are taken on at the head of each rapid; they come out in batteaux to meet the raft, and after their two or three hours' work again leave the raft at the foot; pilots get $5.00 and oarsmen $2.50 wages.

Running the rapids is so much more exciting on the rafts than on the steamers, as one is right beside the waves and sees their tremendous power, almost crushing the great timbers—sometimes the oak drams go 10 ft. under water and the men have to leave their oars and climb on the scaffold. One pilot told me he had seen drowned four raft-pilots, Francis Lartigue, Joe Martin, Charles Shall and Yesaint Pierre.

The voyage withal is a pleasant, enjoyable journey, passing through the beautiful Thousand Islands, among those rich summer places, down the greatest navigated rapids in the world, along the green banks and islands of the great river. Gilded bowed pleasure yachts and little gasolene launches flit back and forth past the raft, between the summer resorts; music and happy voices and bright colored lights indicate the life around that abounds in all loveliness and freedom. In the words of Harmachis, one can exclaim: "Ah! those nights upon the Nile! Their memory haunts me yet."

## THE REPUBLIC OF PANAMA

Consul-General Gudger writes from Panama that the republic of Panama, the youngest member in the galaxy of nations, commenced its national life, Nov. 3, 1903, with practically the unanimous support of all the people of the Isthmus. The republic is divided into seven provinces, with capitals, as follows: Panama, capital Panama; Colon, capital Colon; Bocas del Toro, capital Bocas del Toro; Chiriqui, capital David; Los Santos, capital Los Santos; Veragua, capital Santiago; Cocle, capital Penonome. In each of the provinces there is a governor—alcalde—together with other necessary officials. The ports of the republic on the Pacific are Panama, Agua Dulce, Pedregal, Montijo and Puerto Mudis; and on the Atlantic, Colon, Bocas del Toro and Puerto Bello. There is but one railroad in the republic, and this extends from the Pacific at Panama to the Atlantic at Colon, and is operated by the Panama Railroad Co. It is 47 miles long and was completed in 1855, the first train passing over the Isthmus Jan. 28 of that year. The cost of this road was $7,500,000, and the gross earnings for the year ending Dec. 31, 1903, were $1,267,570.91. The majority of the stock (thirty-four thirty-fifths), formerly owned by the French canal company, has passed to the United States government. The roadbed is in good condition and the rolling stock answers the purposes for the present. There are no dirt roads leading into the interior. It is doubtful if there exist in the entire republic 25 miles of road over which a carriage could pass with ease. The coast line, from the Costa Rican boundary on the Pacific and Atlantic, stretches to the mouth of the Atrato river on the Atlantic and to Puerto Cocolito on the Pacific, the dividing line between Panama and Colombia, a distance, including both sides, of not less than 1,000 miles. The territory lies between 7 deg. 15 min. and 9 deg. north latitude and 77 deg. and 82 deg. west longitude from Greenwich. The area of the republic is 31,500 square miles. In the widest place the Isthmus, which constitutes the republic, is about 160 miles, and at the narrowest between 35 and 40 miles, the extreme length being nearly 400 miles. The republic has a population of 300,000, composed of various nationalities. There are pure and even wild Indians, Spaniards, Colombians, Panamans, Englishmen, Germans, Frenchmen, Chinese, Italians and Americans. It is estimated that there are some 40,000 Jamaicans (who are English) and about 2,000 Chinese, most of whom were attracted to the Isthmus during French canal days. It is difficult to get data concerning the country's resources, but it is generally believed that the forests throughout the interior abound in hard woods and that the hills contain minerals of great value. The hills, mountains and valleys are practically in the same state in which they were when Columbus discovered the new world.

## MOTOR BOATS IN NAVAL WARFARE

That the motor boat may have a definite use in naval warfare is proved by the recent performance of the motor launch Napier Minor in the manoeuvers of the British fleet. Describing precisely what Napier Minor did at the invasion of Essex Mr. F. S. Edge, the designer, writes:

"As during the recent invasion of Essex motor boats have for the first time played an important part in our naval and military manoeuvers, some particulars of the work done by my fast cruising motor launch Napier Minor may prove of interest. Napier Minor was lent by me to the war office for the purpose of demonstrating the usefulness of swift, low-lying craft as tenders and despatch boats during these service operations. After reporting to the admiral in command at Portsmouth prior to the opening of the manœuvers, Napier Minor ran round from Spithead to Brightlingsea, a distance of 200 miles, in 12 hours, 45 minutes. Thereafter, throughout the manœuvers this little 35 ft. light-draught cruising vessel remained in commission and was utilized daily. Her programme was generally as follows. At 5:30 a. m. she ran to the end of Clacton pier, where she took on board the officers commanding or directing the manœuvers. These gentlemen, having made their disposition for the day, would then order Napier Minor to run alongside the Good Hope, lying about three miles out, and thence make a general tour round the cruisers and transports, carrying staff officers from one to the other as required. In the afternoon Gen. Lyttleton and Col. Stacpole would make a complete tour of inspection of all the transports, and of the pontoons by means of which the troops were landed. In many instances the Napier Minor, reducing her speed, accompanied detachments of troops to the landing points, where she would put on shore and embark officers of the staff. In addition to this routine work of conveying the generals during their inspections, the Napier Minor was on several occasions sent out to sea to reconnoiter. It is matter of great satisfaction to know that throughout the manœuvering this motor boat was equal to every demand, and so well did she demonstrate her reliability and practical usefulness that no hitch of any kind occurred during her work on the Essex coast. The officers conducting the manœuvers have expressed their great satisfaction at the work performed by Napier Minor, and there is little doubt that there has been created among war office and admiralty officials an impression which will materially influence and hasten the adoption of motors and motor boats by these great departments of our national defence."

In a little talk before the Chicago Press Club Mr. John F. Wallace, chief engineer, is reported of speaking with enthusiasm concerning the work of George Ehle, engineer in charge of one of the sections along the Panama route. Information obtained by the Ehle party makes it possible to divert the baffling problem of the Chagres river freshets by diverting the stream to the Pacific coast. This could be done at an approximate cost of $16,000,000, thereby saving $20,000,000 for excavating a sea level waterway. The sum estimated for locks was $36,000,000.

Only one bid was received by Maj. Charles L. Potter for dredging the trench for the foundation of the new concrete pier at the southern entrance. This was from the Superior Contracting & Dredging Co. which offered to do the work at 50 cents a yard. The bid was rejected.

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## THE BATTLE OF THE BOILERS.

London, Sept. 1.—The select committee on boilers, appointed by the admiralty, have now issued their final report, whether or not that provides a solution for the problem of the boilers of warships. The committee were called on by the admiralty four years ago to investigate and report on the subject. Since their appointment they have devoted a large amount of care and attention to the task. Their labors were rendered exceptionally difficult by circumstances. A strong feeling against the Belleville boiler had arisen both inside and outside the navy, owing to the difficulties in working these boilers, and to accidents with them. On the other hand, those mainly responsible for the engineering of British warships had come to the decision that the day of cylindrical boilers in these vessels was done. When it was first resolved to adopt water-tube boilers, and to fit them up in the first-class cruisers Powerful and Terrible, the Belleville was the only type that had been tried at sea on a considerable scale under ordinary conditions. One of the first acts of the committee was to pronounce against this boiler. In a report issued about a year after the commencement of their labors the committee recommended that no more Belleville boilers should be fitted into the ships of the navy. They recommended that in ships recently ordered, when the work done on the boilers was not too far advanced, Belleville boilers be not fitted; that Belleville boilers be retained in ships then under construction when the work was so far advanced that any alteration of the type would delay the completion of the vessels; and that, as regards completed ships, the Belleville boilers be retained as fitted. The committee placed on record their strong opinion that the advantages of water-tube boilers for naval purposes are so great, chiefly from a military point of view, that provided a satisfactory type of such boiler, could be adopted, it would be more suitable for use in his majesty's navy than the cylindrical type of boiler. Since then the committee have been endeavoring by various means to discover a boiler which would best answer the objects in view. In their final report they state that having concluded investigations into four types of boilers—Babcock & Wilcox, Niclausse, Durr, and Yarrow—they are now satisfied that the Yarrow and the Babcock & Wilcox are quite satisfactory. Each of these types, they say, has its particular advantages so that the question of which may be the best boiler for particular vessels can only be determined by long experience on general service. For the present they recommend both types as suitable for naval requirements. Thus, they have to some extent altered their attitude towards cylindrical boilers. In a former report they expressed a preference for one-fifth of the boiler power in warships being on the cylindrical system, and four-fifths on the water-tube principle.

### CYLINDRICAL BOILERS IN WAR VESSELS AN ERROR.

They now propose that the water-tube boilers named should be used in all large vessels without any cylindrical boilers. They have been aware that the policy of placing cylindrical and water-tube boilers together in warships has been tried by both Germany and the United States, and afterwards abandoned; and that, according to one American engineering expert, the water-tube boiler has reached a stage of development which makes the use of the cylindrical type in war vessels a grave error, owing to the sacrifice of rapidity in raising steam, swift construction, and repair, and the weight-saving which can be utilized in added speed, armor, or armament. Their recommendations are, however, based on the experimental tests made by themselves, and on the experience they possess of all classes of boilers. While speaking in high terms of the Yarrow and Babcock & Wilcox boilers, they admit that in these the resources of engineering are by no means exhausted. They desire an ample trial for any other type of boiler which may seem to possess merits, and suggest that it should be tried in a new vessel not smaller than a second-class cruiser.

In fact, they find that water-tube boilers are essential, and that according to present knowledge the Yarrow large-tube and the Babcock & Wilcox boilers are the best, and that they should be adopted in all large ships without even a proportion of cylindrical boilers. This latter is the most important change in the attitude of the committee. The committee state that they have seen no reason since they issued their first report to modify the opinion then expressed that it is "undesirable to fit any more of this type in H. M. navy." But, at the same time, they reiterate that the experience obtained by them confirms them in the opinion that "the advantages of water-tube boilers for naval purposes are so great chiefly from a military point of view that provided a satisfactory type of water-tube boiler be adopted it would be more suitable for use in H. M. navy than the cylindrical type of boiler." Having concluded their experimental investigations with the Babcock & Wilcox, Niclausse, Durr and Yarrow large-tube boilers, they are not satisfied that two of these four types—viz., the Babcock & Wilcox and the Yarrow large-tube—are satisfactory and are suitable for use in battleships and cruisers, with cylindrical boilers. In the Babcock & Wilcox boiler the generating tubes are nearly horizontal, in the Yarrow boiler they are nearly vertical. Each type, says the committee, has its particular advantages, and it can only be determined by long experience on general service which is on the whole the better boiler. For the present, the committee unanimously recommend both types as suitable for naval requirements. In making this recommendation the committee state that they recognize that the upkeep of any water-tube boiler is likely to be heavier than that of the cylindrical boiler, but they are of opinion that the two types they now recommend will cost less for upkeep than the other types of large straight-tube boiler which they have had under trial. The committee make these recommendations after investigations and trials carried out under their superintendence extending over a period of nearly four years. As regards small vessels of high speed, the committee state that from the nature of the case some form of "express" boiler, with small tubes closely pitched, is absolutely necessary in order to obtain such a ratio of output to weight of boiler as is required in torpedo boats and destroyers. For small cruisers, however, which have to keep the sea and act with the fleet, it is probable that a boiler such as the Yarrow large-tube would on the whole give better results than the "express" types which have hitherto been fitted.

### RESULTS FROM BABCOCK & WILCOX AND YARROW BOILERS.

The best results obtained with the Babcock & Wilcox boilers of the Hermes were during the trials of furnace gas-baffling the boilers in the middle boiler-room with vertical baffles, and a forced air supply over the fires, giving the high efficiency of 81 per cent on a 30 hours' trial, when 20 lb. of coal were being burnt per square foot of fire-grate per hour, and an efficiency of 77.8 per cent on a 29 hours' trial when burning 27 lb. per square foot, these rates of combustion corresponding to the ordinary rate of steaming, and to the full power of the boilers respectively. The boilers of the Hermes, with its restricted up-take baffling, and without any special air supply over the fires, had a maximum efficiency of 75.8 per cent on a 12 hours' trial, when burning 20.5 lb. per square foot per hour on three trials of over 24 hours' duration each, and when 19 lb. were being burnt per square foot per hour the efficiency was practically the same, 71 per cent. An efficiency of 78.3 per cent was obtained on the 30 hours' trials, when burning 27 lb. per square foot per hour. The maximum efficiency of the Yarrow boilers of the Medea—viz., 75.7 per cent—was obtained on a 26 hours' trial when burn-

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ing 18 lb. per square foot per hour, their efficiency when burning at the maximum rate of combustion viz., 40 lb. per square foot per hour for eight hours—was 69.5 per cent. On trials of over 24 hours' duration, burning from 17 lb. to 21 lb. per square foot per hour, the efficiency remained at or over 75 per cent. The Belleville boilers of the Hyacinth had a maximum efficiency of 77.2 per cent recorded on 24½ hours' trial. When burning 20 lb. per square foot for 11 hours the efficiency was 73.3 per cent, and burning 17.4 lb. for 24 hours it was 71.8 per cent. The efficiency of these boilers on an eight-hours' trial in fine weather when burning 27 lb. per square foot per hour, corresponding to the full output of the boilers, was 65 per cent. The maximum efficiency of the Durr boilers of the Medusa was 64.8 per cent, obtained on an 8-hours' trial when burning 35 lb. per square foot per hour, this being the maximum rate of combustion with these boilers. Between 18 lb. and 21 lb. per square foot the average efficiency was about 61 per cent. Of the cylindrical boilers tried, those of the Saxonia, on the only trial made which was of 13 hours' duration and on which 20 lb. per square foot per hour was burnt, had the high efficiency of 82.3 per cent. The maximum efficiency obtained with the cylindrical boilers of the Minerva was 69.7 per cent, which was recorded on a 25 hours' trial when burning 14 lb. per square foot per hour, on a trial of 8½ hours' duration with retarders in the plain tubes, and burning 29 lb. per square foot the efficiency was 68.4 per cent. In the smaller ships, the maximum efficiency of the Babcock & Wilcox boilers tried was 66 per cent on a 12 hours' trial, burning 18 lb. per square foot per hour in the Sheldrake, and 72.3 per cent on 9 hours' trial burning 13 lb. per square foot in the Espiegle. The maximum efficiency obtained by the Niclausse boilers of the Seagull was 66.9 per cent on an 8 hours' trial, burning 13 lb. per square foot, and by those of the Fantome 69.8 per cent, on a 9 hours' trial burning 14 lb. per square foot. A noticeable feature in connection with the boiler efficiencies is the improvement in the results obtained by the later boilers of the Babcock & Wilcox type. As regards the production of dry steam at all rates of combustion, the Yarrow large tube and the later Babcock & Wilcox boilers have given the best results.

### LOSS OF FEED WATER MODERATE.

The loss of feed water with each of the four types of boiler under consideration has been moderate throughout the committee's trials. In the runs to Gibraltar and back, carried out on the Medea with Yarrow boilers and Medusa with Dürr boilers, the loss of water was small, being at the rate of 1.7 tons each ship per 1,000 horse-power per day. On the 140 hours' endurance trial of the Hermes the loss was 3.8 tons per 1,000 horse-power per day. The loss of water may be expected to be greater in boilers fitted with many doors than in those fitted with but few, and to increase as the doors and joints become worn. In this respect the Yarrow boiler, having only three manhole doors, has an advantage. Of the boilers tried by the committee the Yarrow boiler can be internally examined and cleaned in the shortest time and with the least amount of labor. The Babcock & Wilcox type is less easily examined and cleaned, two small doors have to be removed for every tube and these have to be rejointed after the examination and cleaning have been completed. In order to examine the tubes of the Dürr boiler it is necessary to remove a hand-hole door at the front of each tube, the diaphragm washer of the internal tube, the internal tube itself, and the cap-nut at the back end of the generating tube, but in order to carry out a thorough cleaning it is also necessary to remove the generator tubes from the boiler, and after the cleaning is complete these have to be replaced, this being a long and tedious process. The work connected with the examination and cleaning of the tubes of Niclausse boilers is similar to that necessary with the Dürr boiler. Further, the cap-nut at the back end of the Dürr boiler tube permits of each tube being readily emptied, while owing to the back end of Niclausse boilers being inaccessible, some process is necessary to empty the tubes when required, such as blowing the water out of the tube by a special pump and hose. The necessity for being able to withdraw each of the tubes in a direct line with its axis renders the clear space required for the installation of Dürr and Niclausse boilers considerably more than would be required for boilers of other types. For warships, where the stokehold space is very limited, this must necessarily cause considerable inconvenience in the arrangement of pipes and auxiliary machinery. In the Yarrow and the Babcock & Wilcox boilers it is possible to partially clean the tubes externally, when the fires are alight, by means of air lances. The tubes in the Yarrow boiler can be thoroughly cleaned externally when the fires are not alight, as they can be swept in three directions—viz., from the furnace, from the smoke box, and from the front of the boiler. The tubes of the Dürr and Niclausse boilers cannot be so thoroughly cleaned externally in place, the number of rows being greater, and the overlapping of the baffles preventing portions of certain tubes being touched. In the Babcock & Wilcox boilers the tubes can be swept horizontally through side doors fitted to the casings. After the alterations of baffling the sweeping vertically can be carried out, but this necessitates the removal of portions of the baffles. It is to be recognized that any system of baffling among the tubes, however it may improve the circulation of the gases, renders the cleaning of the tubes themselves more difficult. The committee refer to bending of tubes in the Dürr and Niclausse boilers, and state that it will be necessary to straighten these tubes when the amount of bending exceeds ¾ in. This will entail a considerable amount of extra work with these types of boiler, which will be of service for corresponding periods.

In the case of the Yarrow boilers, which are designed without any curvature of the tubes, the committee experimented in firerows, with tubes purposely bent, with the object of overcoming some slight leakage of tube ends which showed themselves during a forced draft trial. In two boilers the tubes of the firerows were left straight. Although these bent slightly in use, no trouble was experienced with them, and during the later trials these boilers proved to be as satisfactory in regards freedom from leakage as those in which the firerows had been put in bent. They recommend that in future designs the tubes of the firerows be bent one inch from the straight. In the Babcock & Wilcox boilers of the Hermes, although some of the tubes of the bottom rows have bent no leakage of tube ends has resulted and it has not been necessary to remove any tubes for straightening or renewal. In none of the four types of water-tube boiler which were recommended for trial by the committee has there been any considerable corrosive decay of tubes, and the ordinary wear has been very slight.

### THE RESULTS SUMMARIZED.

The Dürr boiler was the only one tried by the committee which had any arrangements for superheating steam. It was fitted with complicated directing plates in the steam collector, and with superheater tubes. The fittings in the steam collector are undesirable and they and the superheater tubes will probably require frequent renewal, while the amount of superheat obtained by their use was small, even when the temperature of the funnel gases was abnormally great. The results obtained were not sufficient to enable the committee to express any opinion as to the value of superheating as applied to naval boilers. No trouble has been experienced with the feeding of any of the four types

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of boilers under consideration. The committee consider that the balance of advantages rests with the omission of automatic feed regulators, in boilers such as the Yarrow large-tube and the Babcock & Wilcox, where there is a fairly large reserve of water in the boiler. Experiments made on the Yarrow and Dürr boilers in regard to their behavior when working with brackish water indicate that neither type of boiler was likely to give trouble from this cause. In the case of the Yarrow boiler this result has been corroborated by the fact that on a recent voyage, the Medea is reported to have had leaky condenser tubes, and a corresponding density in the boilers without any bad effect. In the case of the Hermes and the Medusa the new boilers were installed without any alterations being made in the stokehold floor spaces. A comparison of weight and maximum output of the boilers, gives the following results:

| Type of boiler. | Ship. | Weight of boiler room installation. tons. | Maximum output of steam per hour. lbs. | Output of steam per hour per ton of boiler room weights. lbs. |
|---|---|---|---|---|
| Cylindrical.... | Saxonia . | 1,000 (about) | 132,600 | 132 6 |
| " .... | Minerva ... | 567 | 167,100 | *295 |
| " .... | " .. | 558 | 156,200 | †280 |
| Belleville ..... | Hyacinth .. | 454 | 178,700 | 394 |
| Yarrow .... .. | Medea .... | 330 | 157,800 | 478 |
| Durr ..... | Medusa.... | 304 | 158,000 | 503 |
| Bab. & Wilcox | Hermes .. | 490 | 200,000 | 410‡ |
| " | " .. | 481 | 182,300 | †380 |
| " | Sheldrake . | 125 | 43,840 | 351 |
| " | Espiegle .. | 95 | 24,780 | 261 |
| Niclausse . ... | Seagull | 135 | 43,450 | 359 |
| " ..... | Fantome .. | 76.5 | 22,750 | 297 |

*With retarders. †As originally fitted. ‡With vertical baffles and forced air supply above the fires.

The boiler committee is now dissolved by the issue of its final report, but it is the intention to appoint an advisory engineering committee at the admiralty, and it is understood that this committee will include Engineer-Rear Admiral Smith, Dr. A. R. W. Kennedy, and J. T. Milton of Lloyds, who were all members of the boiler committee. If a committee takes the position of the permanent officials at the admiralty the members must be prepared to give sufficient time to the duties to ensure absolute success. During the investigation of the boiler committee the admiralty staff worked loyally for the advancement of the interests of the navy, and it is now certain that the boiler committee have done work which would not have been effected by the permanent officials. The two boilers now recommended were both introduced into the service before the boiler committee was appointed, and time has proved the efficiency of the new types. The only reversal of admiralty policy by the committee was in recommending that a proportion of the steam generating plant in ships should be made up of cylindrical boilers, but the committee has now discarded this recommendation. As to the Belleville boiler, there is a paragraph in the letter preceding the report, signed by Admiral Domville, who has acted as chairman of the committee. As commander-in-chief of the Mediterranean squadron he has had abundant opportunities of knowing how a Belleville boiler behaves. He says "I am compelled to say that my experience with the Belleville boilers on the Mediterranean station has been very favorable to them as steam generators, and it is clear to me that the earlier boilers of this description were badly constructed and badly used. We have had no serious boiler defects in any of the ships out here, and the fact that two ships are about to be re-commissioned with only the ordinary annual repairs being undertaken, shows that their life is not so short as I originally supposed. However, the second commission of these ships will be a very good test of the staying capabilities of their boilers." Admiral Domville says that he cannot express too highly his opinion of the work done by his colleagues on the committee.

## LIVERPOOL SHIPPING LETTER

Liverpool, Oct. 3.—There has been no new development in the North Atlantic rate war since my last letter, but there is held in Liverpool shipping circles an optimistic view that a further advance in the transatlantic passenger rates will shortly be made, and that by the opening of the spring season, the fares will have been increased to the level at which they stood before the cutting began. As I stated last week, the German lines are transferring the fight with the Cunard to southern Europe, and with the object of injuring the Cunard company's Adriatic trade. They are reducing the American rates for Hungarian passengers. For instance the Red Star and Hamburg-American lines quote special prepaid rates of $10, and the Holland-American $12. The intention of course, is to convey the passengers overland from Hungary and Austria to the North Continental sailing stations, but there seems to be little prospect of this kind of competition proving succesful so far as Hungary is concerned, but may be, the Continental lines will secure some few emigrants from Austria. The Cunard company has however, a very strong position in the Adriatic, backed by the ten years agreement with the Hungarian government, and the German companies in entering upon this new struggle, will soon discover that they have less chance of success than they had in the North Atlantic struggle. It may be remarked that the White Star Line have a Mediterranean service from New York and Boston. The steamers call at Gibraltar, Algiers, Naples, Genoa and Alexandria, but do not call at Trieste and Fiume. As the White Star company has an arrangement with the Italian government, it would not be affected by the "cut" which the German lines have made in Hungary. The success of the Cunard company in its fight with the German lines in the North Atlantic, will it is believed here encourage the company to endeavor to secure even a greater share of the Continental emigrant traffic. In fact there is the best authority for stating that special attention is being directed to the Scandinavian business, and that ere long the Cunard Line will run direct steamers for these emigrants, instead of bringing them via Hull and Grimsby. Hitherto the Scandinavians have traveled chiefly by the lines sailing from England, but if the Cunard take the course foreshadowed of establishing a direct service of steamers, they will undoubtedly secure the bulk of the traffic, and save the $4 or so which it costs at present to bring each of the emigrants from Scandinavia to Liverpool. The excuses the Continental lines are making for their treatment of intending passengers by the Cunard Line at the control stations in Germany are damaging their own cause, and to endeavor to justify their arbitrary proceedings on sanitary grounds is as hollow as it is insincere. The Cunard passengers are sent back from the control stations, not because they are unhealthy, but because they have Cunard tickets, in other words, no emigrant from the east of Europe, whether he be Russian, Austrian, Hungarian or any other nationality is permitted to pass through Prussia or Saxony unless he has a ticket for the German lines or one of the lines they are pleased to regard as allies. For the Cunard Line, not one such emigrant is allowed to pass, and there is no wonder it is being asked "whether there is any justice left in Germany."

The stream of Canadian emigration from the Mersey port still continues exceptionally strong for the time of the year, and even now, so late in the season, the Liverpool landing stage invariably presents a busy scene on sailing days. For the most part the emigrants are of the artisan and laboring class, and these are the people that Canada is in need of. No doubt a large number have been attracted by the low fares, and by the authentic statement that the Canadian harvest will this year prove a record. Reference to the Dominion reminds me that Canadian shippers in Liverpool are complaining greatly of the extra work they have to perform in connection with their shipments to Canada in view of the new customs regulations which take effect on and after Oct. 1. In addition

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to having to provide a duplicate invoice certified, the invoice must contain a full description of the goods, the price sold at to the importer, the place of manufacture, and the current price for home consumption in the place of origin. The minister of customs in Canada reserves the right to fix the value for duty purposes at his own figure, which will bear relation to the price for home consumption at the place of origin. As the shippers point out, this procedure is apparently aimed against the dumping of stuff into Canada at prices cheaper than are current at the exporting center. In reality it is described as and this protectionist move and the opinion seems to be that it will be useless to protest against the cumbersome formalities which the new regulation imposes.

The trial trip of the Midland Railway Co.'s new turbine steamer Manxman, built by Messrs. Vickers, Sons & Maxim at Barrow, has just been completed, and a new record in propulsion by means of the turbine has thereby been established. In her several runs over the measured mile she gave a speed of 23 knots, proving herself to be the fastest turbine merchant steamer afloat. Hitherto the steam pressure for turbines has been kept down at 150 lbs. per square inch, but in this vessel 200 lbs. pressure has been provided, and this has led not only to higher speed, but to economic results. The turbines fixed in the Manxman are Parsons' patent and the satisfactory results established go much to prove that success will follow the effort to introduce turbines on the great Atlantic steamers. Three other steamers have been built for the Midland Railway Co., two having reciprocating engines, and one turbines, all having attained satisfactory speed results. The Manxman has been built for the new Heysham and Isle of Man service, but can be used on the Belfast route. She will carry 1,500 passengers.

It is currently reported here that an American syndicate is acquiring controlling interests in certain Lancashire collieries near Wigan. The properties are not to be purchased outright, the Americans are investing some hundreds of thousands of pounds sterling in them, and it is their intention to open up depots in various parts of the United States. The Lancashire coal trade has not been over prosperous for some time, but a change for the better is expected with the advent of winter. New mines are being sunk in the Manchester, Bolton and Wigan districts, and developments now in progress are costing according to some authorities close upon two millions sterling.

Capt Fraser, Chief Officer Mackenzie, Carpenter C. O. Nelson, and A. B.'s Ingolsen and Monsen of the Liverpool steamer Micmac, have just been made the recipients of life-saving awards presented by the American government for their bravery and humanity in rescuing the captain and crew, seven all told, of the American schooner Willie L. Newton on Feb. 21 last, off the coast of Virginia, in the North Atlantic ocean. The awards consisted of gold watches, suitably inscribed, to Captain Fraser and Chief Officer Mackenzie, and gold medals to the other members of the boat's crew.

Another retirement of a prominent White Star Line official in the person of Mr. S. Gordon Horsburgh, R. N. R., who has held the very important position of superintendent engineer of the White Star Line for over thirty-five years. He will however retain his connection with the company for some time to come as consulting engineer. Mr. Horsburgh has been intimately connected with all the improvements, alterations, etc., necessary to meet the requirements of such a progressive line as the White Star, commencing, as he did in 1871 with the old Oceanic of 3,800 tons, to the largest steamer in the world, the steamship Baltic of 23,875, and it is no exaggeration to say that he has, by his great engineering and ship building skill, organizing abilities and business qualities, helped in a very marked degree to make the White Star Line the great success it has proved to be. In his long business career in the White Star service, he has made innumerable friends, who join with the firm and the employes in wishing him many years to enjoy his thoroughly well earned rest. Mr. Willett Bruce, R. N. R., assistant superintendent engineer of the White Star Line, has been appointed to succeed Mr. S. G. Horsburgh. Mr. Bruce has been twenty-three years in the White Star service, for the bulk of that time on sea duty. Nine years ago, when Mr. Bruce was chief engineer of the Adriatic, he was selected out of 400 applicants as assistant to the chief he now succeeds, and with whom he has been a loyal and valued colleague up to the present time. Mr. Bruce is well known and highly esteemed also for his active service in the royal naval reserve.

The Manchester Liners, Ltd., have just made the interesting announcement that the firm is in receipt of a subsidy to make certain sailings from Sydney, C. B., and Charlottetown, Prince Edward Island, and by way of experiment they have decided to despatch the Manchester Importer on Oct. 13 to the ports named, and to Chicoutimi, the great wood pulp port. It is hoped to make the service a regular one.

Orders have been issued for the curtailment of the service of the American Line between Philadelphia and Liverpool. Hereafter vessels will run fortnightly instead of weekly, which course will be followed indefinitely.

I have just received the Liverpool Underwriters Association casualty returns for September which show that the total casualties to vessels of 500 tons gross register and upwards, which have been posted in the loss book during the month ended Sept. 30, were 397, as against 455 in September last year, 401 in September of 1902, and 371 in the corresponding month of 1901. Of this number 20 were total losses, as under: British, sail 6 vessels of 10,308 tons, and steam, 8 ships of 21,608 tons; foreign: sail, 3 vessels of 5,380 tons, and 3 steam of 5,000 tons. The partial losses numbered 377, and are classified as follows: 10 sail and 181 steam, British; and 32 sail and 154 steam, foreign. The nature of casualty is given as follows: Weather damage, 42; founderings and abandonments, 1; strandings, 135; collisions, 126; fires and explosions, 30; missing, 2; damage to machinery, shafts and propellers, 46; and the casualties 15. Total 397.

## MEAN STAGES OF WATER

The gage records of the United States lake survey show the following mean stages of water above mean sea level, for September, 1904:

| | Stages during Sept. | Higher Lower than during same month last year. | | Higher Lower than during Sept., 1895. | |
|---|---|---|---|---|---|
| | Feet. | Feet. | Feet. | Feet. | Feet. |
| Lake Superior | 603.08 | ..... | 0.19 | ..... | 0.01 |
| Lake Michigan | 581.19 | 0.42 | ..... | 1.51 | ..... |
| Lake Huron | 581.37 | 0.57 | ..... | 1.43 | ..... |
| Lake Erie | 572.64 | 0.05 | ..... | 1.96 | ..... |
| Lake Ontario | 247.38 | 1.18 | ..... | 3.34 | ..... |

Present fall Lake Huron to Lake Erie, 0.52-ft. more than year ago.

A circular letter has been sent to all local inspectors by Supervising Inspector General George Uhler of the steamboat inspection service directing them to see that all life preservers on board passenger vessels are in good condition. The local inspectors are required to stamp on all preservers that are in good condition and to stencil the word "condemned" upon all life preservers that are in bad condition. The purpose of this is to compel passenger lines to purchase new preservers when the old ones are decayed.

After entering the port of Ashtabula the steamer John W. Gates, drawing 19 ft., ran aground. Three tugs in conjunction with yard engines worked on her, but were unable to move her. The Gates was so located as to block navigation in the main river.

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It can truthfully be said that the Democratic party has done more for shipping than the Republican party. Certainly in the early years of the republic shipping flourished whereas during the past forty years while the Republican party may be said to have been almost continuously in control of either the executive or legislative branches of the government it has done absolutely nothing for shipping except to make promises. The utterances of the Democratic party in the present campaign on the shipping question were published in the last issue of The Review and it will be seen that that party has actually made the shipping question the leading question of the campaign. It is a curious thing that the Republican party, pledged as it has been to the policy of protection, should have so steadily and continuously ignored the great marine industry of the country. Every time the issue of shipping has arisen in congress the Republican party has failed to face it courageously. The word subsidy is the bugaboo which seems to make the Republican party take to cover. Yet subsidy is only another word for protection. Meanwhile American tonnage has fallen to 873,000 tons, actually less than it was in 1810, and the enormous carrying trade of the country is practically carried by foreign vessels. To say that 8 per cent of it is carried in American ships is virtually to admit that all of it is carried in foreign vessels. With native resources that are unsurpassed, with a numerous and active population, with the ocean touching three sides of the continent it is incredible that this condition should exist. It is time to wake up.

Shipping in the foreign trade should be protected by the national government. Protection to shipping will stimulate the export trade of the United States because it will materially assist in the establishment of branch houses of manufacturing plants and branch banks in all quarters of the civilized globe. Protection to shipping would be directly responsible for the projection of shipping lines to countries at present inaccessible to the American manufacturer. Protection to shipping would directly result in a large increase in the work of every ship yard in the United States and the probable establishment of additional ship yards. No product of human ingenuity gives more diversified employment than the building of a ship. It is labor from the start. Labor to mine the ore, labor to shovel it into the cars, labor to transport it to the shipping docks, labor to transfer it to the ships, labor to carry it along the chain of the great lakes, to dump it again upon Lake Erie docks and to transport it to the furnaces. In every step of the way, from the furnaces to the Bessemer converter, to the rolls and shaping machines it pays a tribute to labor. Then think of the variety of finished products that must go into the making and equipping of a ship. Before she takes her final plunge into the water hundreds of separate and distinct establishments have worked upon her. Protection to shipping would revivify this great industry. It would stimulate enterprises subsidiary to it throughout the length and breadth of the land. No single act that congress could perform would redound to so much good to the entire nation than assistance in regaining the foreign trade in shipping. Let no man make the mistake that the ship owner and shipper are the only persons concerned in this. The merchant, the banker, the manufacturer and the farmer are just as vitally concerned.

The Merchant Marine Commission, which is the creation of a Republican congress, has lately made a tour of the country and is to formulate its report to be presented to congress at its opening session next December. It is, of course, too early to predict what remedy this commission will recommend, but there is reason to believe that its report will be found favorable to discriminating duties. This form of remedy is also the one advocated by the Democratic textbook. It may therefore be found that no great division exists between the two great parties upon this question and with the unanimity of opinion some measure calculated to remedy the existing state of affairs may be evolved. The shipping question is not a party measure and should not be regarded as one.

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## SHIP YARDS WILL BE VERY BUSY

Sufficient is known to give assurance to the statement that the ship yards of the great lakes will have all that they can possibly attend to during the winter. Contracts have already been awarded to the various yards to keep them very well employed indeed while negotiations are under way for additional steamers. All of the freighters for which contracts have been given and for which orders are pending are of the most modern type equaling or exceeding 500 ft. in length and designed especially to facilitate dispatch in port. No better illustration than the abundance of these orders could be given of the soundness of lake trade in general in the judgment of experienced men. Mr. G. A. Tomlinson of Duluth gave contracts to the American Ship Building Co. this week for two new steamers of the most modern character. They will be 524 ft. over all, 504 ft. keel, 54 ft. beam, and 30 ft. deep. They will have triple-expansion engines with cylinders 23½, 38 and 63 in. diameters by 42 in. stroke. The boilers will be of the Scotch type 14½ ft. in diameter and 11½ ft. long, allowed 180 lbs. pressure and fitted with Ellis & Eaves draft. The hull construction will be in the arch system with straight hoppers. The American Ship Building Co. also this week closed contract with Mrs. Anna C. Minch and Henry Steinbrenner for the construction of a freighter to be a duplicate of the one building at the Lorain yard for Mr. G. A. Tomlinson of Duluth. She will be 500 ft. over all, 480 ft. keel, 52 ft. beam and 32 ft. deep. Her construction will be of the arch system which has proved so great a convenience in the Wolvin and Sahara. She will have triple-expansion engines with cylinders 22½, 36 and 60 in. diameters by 40 in. stroke. Steam will be supplied by two Scotch boilers 13 ft. 9 in. in diameter and 11½ ft. long, allowed 180 lbs. pressure and fitted with Ellis & Eaves draft. Mrs. Anna C. Minch who has just given this order to the American Ship Building Co. is the oldest person connected with the lake trade, both in point of years and of continuous service. She has been steadily identified with the commerce of the lakes, it might be said, since iron ore began to be shipped from Lake Superior. Though she is over eighty years of age she is personally active and watches the movement of the business daily. Two years ago she christened the steamer Anna C. Minch, launched from the Cleveland yard of the American Ship Building Co. She is quite thoroughly informed upon the entire lake situation and the fact that she has given an order for a steamer of these dimensions proves that she recognizes the economy of the large carrier. This makes ten steamers of great size that the American Ship Building Co. is to build for delivery next spring.

The Great Lakes Engineering Works of Detroit announced during the week the closing of two additional contracts. Mr. G. A. Tomlinson of Duluth gave an order for a duplicate of the steamer which this company is also to build for him. She will be 524 ft. over all, 504 ft. keel, 54 ft. beam and 30 ft. deep. This makes three steamers of the largest class that Mr. Tomlinson has ordered for 1904 delivery. The other steamer for which contract was closed during the week by the Great Lakes Engineering Works is to be a package freighter for the Western Transit Co., a duplicate of the steamer Duluth.

As previously stated, other negotiations are actively under way and it is predicted that every ship yard on the lakes will have all that it can possibly do in new construction. The number of berths whereon ships of this class may be built on the great lakes is limited and all of them are likely to be filled.

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The steamer F. H. Prince of the Rutland Transit Co.'s fleet bound from Chicago to Ogdensburg with grain ran ashore on Rock Island twelve miles west of Port Colborne last week. Two tugs and a lighter were sent to her assistance.

## CHICAGO GRAIN REPORT

Chicago, Oct. 11.—From last report the vessel and shipping demand has been about even and rates have been held steadily *a* 1⅜ cent wheat, 1¼ cent corn and 1⅛ cent oats to Buffalo, Georgian Bay, etc., with nominally 3¾ cents corn to Montreal. Some falling off in local receipts having as an offset improved the shipping call at Lake Superior ports the tendency, from the vessel standpoint rather leans to improvement.

The October report of the agricultural department, as announced yesterday, suggests in the crop progress as compared with a year ago, as follows:

| | Crop of 1904, Bus. | Crop of 1903, Bus. |
|---|---|---|
| Wheat | 551,000,000 | 637,000,000 |
| Corn | 2,316,000,000 | 2,244,000,000 |
| Oats | 888,000,000 | 784,000,000 |
| Rye | 27,000,000 | 29,000,000 |
| Barley | 140,000,000 | 132,000,000 |

Shipments as noted below for this week are distributed about as follows: Via all rail lines of wheat, 250,000 bu.; of corn, 170,000 bu., and oats, 466,000 bu.; via lake to Buffalo and other American points of wheat, 50,000 bu.; of corn, 1,000,000 bu., and oats 265,000 bu.; and to Canada points via lake, of corn, 540,000 bu., and oats, 100,000 bu.

Lake and Rail Shipments:

| | This week. | Last week. | Same week last year. |
|---|---|---|---|
| Wheat | 312,942 | 576,116 | 893,604 |
| Corn | 1,719,238 | 2,311,560 | 4,049,122 |
| Oats | 834,085 | 774,251 | 1,084,805 |
| | 2,866,265 | 3,661,027 | 6,027,531 |

| | Shipments since Jan. 1, 1904. | Same time last year. |
|---|---|---|
| Wheat | 11,810,809 | 16,518,313 |
| Corn | 59,466,077 | 71,880,104 |
| Oats | 35,388,228 | 51,094,353 |
| | 106,674,174 | 139,492,770 |

Stocks of Grain in Elevators:

| | This week. | Last week. | Same week last year. |
|---|---|---|---|
| Wheat | 4,413,000 | 4,779,000 | 6,128,000 |
| Corn | 4,350,000 | 4,824,000 | 5,025,000 |
| Oats | 10,811,000 | 10,616,000 | 2,714,000 |
| Rye | 719,000 | 744,000 | 560,000 |
| | 20,293,000 | 20,963,000 | 14,427,000 |

## THE FREIGHT SITUATION

While ore is moving heavily shippers are experiencing no trouble in getting vessels. In point of fact ore is not reaching upper lake docks quite as rapidly as the vessels arrive to care for it and the supply of vessels may be said to be slightly in excess of cargoes. It is expected that the October movement of ore, however, will be very heavy and practically on a par with the September movement. It is not exactly fair to compare the September movement of this year with that of last because during September last year the Steel Corporation was seriously crippled by the sudden strike of the Masters' and Pilots' Association against it. It is estimated that the effect of this strike was equivalent to the movement of 500,000 tons during that month. It is expected that the November movement this year will be very light, but even with only nominal movement during that month the total ore shipments of the year are likely to be in the neighborhood of 18,000,000 tons.

Grain carriers are somewhat congested at Buffalo as shippers have advanced the rate from the head of the lakes to 2¼ cents. The coal trade still continues to be disappointing.

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## OFFICERS OF AMERICAN SHIP BUILDING CO.

The American Ship Building Co. is one of the most conservatively organized and one of the most solid business enterprises in the United States. The fact that it has a surplus of nearly $4,000,000 is sufficient assurance of the soundness of both these assertions. It is a striking commentary on the tendency of the times that this organization should be exclusively managed by young men. At the last annual meeting both the constructive and financial management of the company was given over to the younger element.

Especially interesting has been the career of Mr. James C. Wallace, the new president. He is not yet thirty-nine years old and yet in that brief space of time he has worked his way up through every department along constructive lines. He

MR. J. C. WALLACE, PRESIDENT.

MR. ROBERT LOGAN, GENERAL MANAGER.

MR. RUSSELL C. WETMORE, VICE PRESIDENT AND TREASURER.

MR. ORA J. FISH, SECRETARY AND ASSISTANT TREASURER.

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occupies a most commanding position among young men as his company occupies a most commanding position among the industrial enterprises of the nation. Mr. Wallace began his business life in 1881 in the machinist's trade in which he served for three years. In 1884 he went with the Globe Iron Works, Cleveland, starting in the machine shops and then taking up work in the ship yard and later in the drafting room. For a brief period of time thereafter he sailed on the steamer Onoko as assistant engineer.

When the Cleveland Ship Building Co. was formed in 1887 he was placed in charge of the drafting room. In 1890 he was named assistant superintendent of the company and in 1893 was appointed vice president and general manager. In 1899 when the American Ship Building Co. was formed, taking over the plant of the Cleveland Ship Building Co., Mr. Wallace was given the position of general manager and vice president of the new company. This position he steadily occupied until his election as president last week. When the giant steamer Augustus B. Wolvin was launched, Mr. A. B. Wolvin took occasion to say, in commenting upon the structural difference between that steamer and the ordinary class of freighter that it would keep anyone busy to keep up with the progressive ideas of Mr. Wallace. In this he paid a tribute to Mr. Wallace's boldness in design and undoubtedly a great many of the radical departures which have been made in ship construction on the great lakes during the past few years have been due to his initiative.

Mr. Robert Logan, the new general manager, was born near Glasgow, Scotland, and came to this country at the age of twenty-seven years. He is a graduate of the College of Science and Arts of Glasgow, whose diploma he holds, and obtained his education in a practical way in the ship yards on the Clyde. The Canadian Pacific Railway is responsible for his coming to this country. He went to Canada in 1888 in order to design and look after the building of the steamer Manitoba for the Canada Pacific. He had intended returning home when the Manitoba was completed, but before that event occurred the company decided to build the car ferry steamer Ontario, now plying in the Detroit river, and Mr. Logan prepared the designs for her and superintended her construction. After that he designed several vessels for the Canadian government. The fact that he had been so long away from home determined him then to make his residence in this country and he accordingly came to Cleveland in 1893. Since then he has been steadily engaged in the general work of a marine architect and marine surveyor and is responsible for a number of the splendid car ferries now on the lakes. Just a year ago he went to the American Ship Building Co. as assistant general manager. Mr. Logan is a characteristically thorough man and keeps well abreast of the general advance in his profession. During the past summer he returned to Great Britain to make a special study of the turbine engine as a means for marine propulsion.

Mr. Russell C. Wetmore who was elected last week as vice president and treasurer of the company has confined his attention wholly along financial lines. While he is a native of Ohio he spent his boyhood in Marquette, Mich., where he was engaged in mercantile pursuits with his father. He later went to Chicago as secretary and treasurer of the Chicago Telephone Co. and was connected with that institution for fourteen years. He then went to New York as secretary and assistant treasurer of the American Steel Barge Co. of West Superior and occupied that position for six years. The American Steel Barge Co. operated a ship yard at West Superior, Wis., and was responsible for the design, construction and operation of the fleet of whalebacks on the lakes. When the American Ship Building Co. was formed in 1889 it took over the West Superior plant of the American Steel Barge Co. and Mr. Wetmore was appointed to the position of secretary and treasurer of the new ship building company. He transferred his headquarters to Cleveland and has occupied the position of secretary and treasurer ever since.

The training of Mr. Ora J. Fish, the new secretary and assistant treasurer, has also been along office lines. He entered the employ of the Globe Iron Works in 1887 and up to the time of the formation of the American Ship Building Co. in 1889 occupied the position of bookkeeper and cashier for the Globe. When the ship building combination was formed he became the chief clerk of the American Ship Building Co. and occupied that position until October, 1902, when he was made assistant secretary and treasurer. He has been a most conscientious and earnest worker.

## COMMERCE OF SAULT STE. MARIE CANAL

The monthly summary of commerce prepared by the superintendent of the Sault Ste. Marie canal shows that the commerce of the month of September was exceedingly heavy, 5,246,657 tons having passed through the canals during the month. While the commerce through the canals to Oct. 1 lacks 6,804,188 tons of equaling the commerce for the corresponding period of last year, it is nevertheless proportionately greater than the commerce of last year. Navigation on the great lakes did not practically open this year until June 15, so that a good six weeks was altogether lost. The commerce to Oct. 1 of the present year aggregates 20,089,632 tons as against 26,893,820 tons to Oct. 1, 1903. This discrepancy is likely to be minimized, however, by the end of the present month for the movement this month is exceedingly heavy for October. Following is a summary of Sault Ste. Marie canals brought up to Oct. 1 of the present year with comparative statements for the corresponding periods of the two preceding years:

**Movement of Principal Items of Freight to and from Lake Superior.**

| ITEMS. | To Oct. 1. 1904 | To Oct. 1. 1903 | To Oct. 1. 1902 |
|---|---|---|---|
| Coal, anthracite, net tons | 638,459 | 893,153 | 114,188 |
| Coal, bituminous, net tons | 3,208,389 | 4,642,588 | 3,455,608 |
| Iron ore, net tons | 12,394,797 | 17,745,150 | 18,536,170 |
| Wheat, bushels | 20,394,837 | 30,421,255 | 40,444,267 |
| Flour, barrels | 2,189,546 | 4,507,452 | 5,887,591 |

**Report of Freight and Passenger Traffic to and from Lake Superior, from Opening of Navigation to Oct. 1 of Each Year for Three Years Past.**

EAST BOUND.

| ITEMS. | To Oct. 1. 1904 | To Oct. 1. 1903 | To Oct. 1. 1902 |
|---|---|---|---|
| Copper, net tons | 65,533 | 76,359 | 85,060 |
| Grain, other than wheat, bushels | 12,094,233 | 13,790,255 | 6,616,911 |
| Building stone, net tons | 19,116 | 9,640 | 30,332 |
| Flour, barrels | 2,189,259 | 4,507,402 | 5,887,456 |
| Iron ore, net tons | 12,394,797 | 17,745,150 | 18,536,170 |
| Iron, pig, net tons | 28,282 | 13,083 | 11,878 |
| Lumber, M. ft. B. M | 624,014 | 713,017 | 834,216 |
| Silver ore, net tons | 1,313 | ..... | 1 |
| Wheat, bushels | 20,394,837 | 30,421,255 | 40,444,267 |
| Unclassified freight, net tons | 63,784 | 69,863 | 91,852 |
| Passengers, number | 17,091 | 26,137 | 26,706 |

WEST BOUND.

| | | | |
|---|---|---|---|
| Coal, anthracite, net tons | 638,459 | 893,153 | 114,188 |
| Coal, bituminous, net tons | 3,208,389 | 4,642,588 | 3,455,608 |
| Flour, barrels | 287 | 50 | 135 |
| Grain, bushels | 1,625 | 1,200 | 18,627 |
| Manufactured iron, net tons | 111,574 | 111,876 | 122,720 |
| Salt, barrels | 281,950 | 300,668 | 326,339 |
| Unclassified freight, net tons | 372,828 | 377,753 | 425,378 |
| Passengers, number | 16,871 | 25,869 | 26,187 |

**Summary of Total Freight Movement in Tons.**

| | To Oct. 1 1904 | To Oct. 1 1903 | To Oct. 1 1902 |
|---|---|---|---|
| East bound freight of all kinds, net tons | 14,716,540 | 20,818,355 | 22,146,844 |
| West bound freight of all kinds, net tons | 5,373,092 | 6,075,465 | 4,166,078 |
| Total freight, net tons | 20,089,632 | 26,893,820 | 26,312,922 |

Total number of vessel passages to Oct. 1, 1904, was 10,584, and the registered tonnage, 15,090,376.

The steamer Sitka which stranded on Point Sable, Lake Superior, is a total loss and has been abandoned by the owners.

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## COMPASS ADJUSTMENT ON THE LAKES

Editor Marine Review.—Custom and tradition are the bugbear of many conditions in life and when unintentionally supported by indifference on the part of those having the power to change such conditions, the entering wedge to greater and more efficient progress encounters almost insurmountable difficulties. That such a condition exists on the lakes with reference to the compass and its errors is beyond the question of a doubt and it is living a most luxurious life on the diet of indifference bountifully furnished by the vessel owners.

From the writer's point of view the position taken by the owners would seem to arise primarily from ignorance as to the actual importance of the compass on board a vessel and secondarily from business conditions such as loss of time due to the proper adjustment and the bill of an expert compass adjuster. Custom and tradition support them in this for they no doubt reason that conditions have been satisfactory for a number of years as regards the mere running of their vessels, and why should they bother about a change. The old saying that "Ignorance is bliss" is very fairly exemplified in the consideration given the compass, but a careful perusal of statistics of groundings in fog and thick weather should turn the bliss into sorrow. It would were it not for the fact that the insurance companies step in and pay the bill and the owner apparently never worries over the cause that might have led to the disaster, which, in a vast majority of cases, is, either directly or indirectly, the compass.

The writer is in hearty accord with Lieut. Faust in his views on the "Problems of Lake Transportation," published in the Marine Review of Aug. 6, 1903, and firmly believes that the reforms suggested, properly carried out, would vastly increase the efficiency of the shipping on the lakes and inure to the profit of the owners and insurance companies. Custom and tradition, however, form a great barrier to any changes affecting such a large body of men and the transition from the present state of affairs to one more to be desired is bound to be slow.

Not so, however, with a change affecting only a few, and the intent of this article is to bring to the attention of owners and others interested, certain abuses and impositions practiced in the adjustment of compasses, which half an effort would correct, either by very simple legislation on the part of the general government or action of an association such as the Lake Carriers.

As a prelude to a further discussion of the subject, Capt. Lecky's remarks on professional compass adjusters in his "Wrinkles in Practical Navigation" hit the nail squarely on the head when applied to existing conditions on the lakes and are therefore quoted: "Enough has been said to convince anyone that reliable compass adjustment is beset with difficulties and cannot be lightly undertaken. What dependence, then, can be placed on the hurried performance which is daily witnessed in some of our largest ports, when a lot of magnets are slapped down as the vessel leaves the dock gates, and a deviation card handed to the captain worth little more than the paper it is written on? This, however, is seldom or never the adjuster's fault, but is the result of a vicious system against which conscientious men dare not show fight, since less scrupulous competitors are ever ready to step in and adjust (?) in half the time, if necessary, and for half the money. Strange to say, anyone with sufficient money or credit to rent a shop can style himself a compass adjuster, as no government test examination is required; so, for legal purposes, Tom, Dick and Harry suit equally well."

In the last six years the number of men engaged in the adjustment of compasses has steadily increased until during the present season of navigation there are some fifteen or sixteen at work, many of them belonging to the Tom, Dick and Harry class and adjusting for almost any price in order to get the business in competition with the others. The only excuse for the existence of these self-styled compass adjusters is the ignorance of the masters, as a class, in the most simple principles of navigation as applied to the compass, combined with indifference on the part of the owners. Disregarding these two facts for the moment, does it not seem strange that insurance companies, from a purely business standpoint, do not appear to have noticed in these years of experience and statistical records that compasses, not intelligently used, have been the cause of many a loss and seek a remedy? A remedy that here suggests itself to the writer is to have the insurance companies control the adjustment of compasses and employ none but expert and conscientious men, as much the latter as the former because the ignorance of masters opens the door wide to unscrupulous work. A staff of such men on the lakes, under such control, would pay for themselves by a wide margin every year.

But to return to the Tom, Dick and Harry class of adjusters. It looks like a very simple matter to go aboard a vessel and tack down a couple or so magnets to correct the compass after taking a bearing or two of the sun and referring to azimuth tables. Its apparent simplicity is what has given rise to the Toms, Dicks and Harrys. They have seen it done a number of times perhaps, and parrot-like have learned their lesson, no doubt firmly convinced in their own minds that they have completely mastered the subject. The mechanical part they have mastered to a greater or less degree and results may be satisfactory in the most simple cases, but give them a complex case, as the vast majority are on the lakes, and they will be woefully at sea, not possessing the most superficial knowledge of the first principles of magnetism.

Any adjuster who knows his business will tell you that conditions on the lakes are abnormal to start with, hence efficient and conscientious work can only be accomplished after the most painstaking labor. The abnormal conditions arise from various sources, chief among them being the entire lack of intelligent consideration given the compass on the part of the builder, owner and master, or anyone having anything to do with it. The writer has seen a compass placed in a pilot house within a few inches of a steam steering gear to correct which, by the ordinary methods of adjustment, would destroy its directing force entirely, thus rendering it practically useless. Still a so-called adjuster tackled it and the owner footed the bill, though the compass was not improved in the least either by the work or expense. An expert and conscientious adjuster, after only a few moments investigation, would have informed the owner that either the compass or steering gear would have to be moved before any good could be accomplished. Cases of improper disposition of compasses are too numerous to mention, though many are as extreme as the one cited. As to the intelligent consideration given by the master the writer has personal knowledge of one that will suffice. He was asked some years ago by a master of a large passenger steamer to look at his compass, upon doing which it was seen at a glance that the quadrantal correctors were not in place on the binnacle. Upon being asked where they were, the master replied that he had taken them off and stowed them below as they were in the way. The builders themselves do not seem to pay any particular attention to even exercising any great care to get the fore and aft line through the center of the compass in the keel line of the vessel. This fact alone has caused more trouble to the Tom, Dick and Harry class than one would imagine for the very simple reason that, nine times out of ten, they don't know where to look for the cause though the effect is very apparent.

The lack of intelligent consideration given the compass on the part of the men that have to do with it forms but a part of the abnormal conditions with which the adjuster has to contend. The other part is due to the design of lake vessels, which put them on an even keel when loaded and when light drawing from 12 to 14 ft. aft and 1 ft. or less forward. Certainly no one with any knowledge of compass adjustment at

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all will say that adjustment in one condition will hold for the other. Yet, the Toms, Dicks and Harrys go aboard a vessel in either light or loaded condition, adjust and inform the captain his compasses are correct. As a matter of fact, if the adjustment is properly done, the compass will be correct, or practically so, for that particular condition of loading and no other, and the captain should be so informed, so as to be on his guard when he takes on or discharges cargo.

Another fact inimical to the proper adjustment of a vessel's compass is the disinclination on the part of some masters or owners to give the adjuster time enough to do his work thoroughly. The natural result is that the work is only half done and the owner is paying for something he is not getting. Anything worth doing at all is worth doing well, and if masters and owners knew more of the subject they would be money ahead by giving as much consideration to the compass as they do to the steering gear for instance. The latter is not very liable to break and cause disaster if inspected and approved before being put in place. When it does, however, something usually happens that causes expense and loss of time to a greater or less extent. In the same way a compass not properly adjusted and given intelligent handling by the master will lead to disaster in fog or thick weather. The master thinks he has his course down fine or has been told by some adjuster that his compass was correct and only finds out that a mistake has been made somewhere after his vessel finds the bottom.

As far as concerns the Tom, Dick and Harry class of compass adjusters the most efficient remedy to limit their operations would be to require more knowledge of the compass and laws of magnetism, or in other words navigation, on the part of masters, who would then be in a position to use intelligent judgment as to the capabilities of the individual. Unfortunately, this is impossible at present, though indications point to a time in the not distant future when such will be the case. Procrastination is dangerous, however, so we have to look to some other means more immediate in effect and the following suggest themselves as available:

1. Require every compass adjuster to secure a license in accordance with legislation to be enacted by congress. This would put them on the same footing as other men responsible for life and property on the water.

2. Have a combination of vessel interests like the Lake Carriers' Association adopt a certain standard and require all adjusters to fulfill its requirements before permitting them to adjust the compasses of the vessels enrolled in that association. Certificates of qualification could be issued for mutual protection.

3. Make compass adjustment a branch of marine insurance as suggested in another part of this paper.

In conclusion the writer begs to state that for the last six years he has taken a quiet, but none the less sincere, interest in the compass and its use and abuse on the lakes and that this paper is the result of personal observation. Should it have the effect of awakening an interest in a most important branch of marine economics, its mission will be fully accomplished. As a fair illustration of the importance of the subject as a whole it will suffice to state that the navy department maintains as a part of its organization a compass office, not the least important work of which is instruction in the compensation and correction of compasses to those officers detailed as navigators of the vessels of the navy. If men of the acknowledged professional attainments of naval officers as a class require or can be benefited by such a course of instruction it seems strange that such work should be undertaken by some who have not even the experience of a landsman on board ship, let alone any knowledge of navigation, of which the compass is a most important part.

CREIGHTON CHURCHILL,
United States Navy, retired.

Sault Ste. Marie, Mich., Oct. 10, 1904.

## ORE SHIPMENTS VERY HEAVY

The comparative statement of ore shipments shows in what manner ore is being rushed to Lake Erie docks. During September 4,006,442 tons of ore were shipped from upper lake ports as against 2,946,639 tons for September, 1903, an increase of 1,059,803 tons or 35.96 per cent. This is an enormous increase for a single month, but it is being handled without the slightest effort, showing with what consummate ease modern methods of transportation can handle a commerce that fluctuates so widely. The total shipments of ore up to Oct. 1 of the present year are 13,622,438 tons, as against 19,376,493 tons to Oct. 1, 1903, a decrease of 5,754,055 tons or 29.69 per cent. Of course, it is understood that the real cause of this decrease is the late opening of navigation. Since navigation opened the movement has been approximately, month for month, as great as it was last year and, as shown, for the month of September it has been much greater. The total movement last year by lake was 23,500,000 tons and while it is not intended that the movement this year shall be as great as last, it is not likely that there will be 5,000,000 tons difference between the two years. October shipments will probably be as much in excess of October shipments last year as the September shipments were. The cause of this excessive flow of ore has been the determination of the Steel Corporation to amplify its reserves. It expects to have its stock piles quite as ample as they were last year when it began the winter with probably 3,500,000 tons in reserve on Lake Erie docks. Under normal conditions the trade with a movement of ore so heavy during fall months the freight rate would be much higher than it is. But dispatch has been unusually excellent so that there has not been a shortage of vessels while both coal and grain trades have proved to be quite disappointing.

## DREDGE BURTON COMING TO THE LAKES

Maj. Dan C. Kingman, government engineer with headquarters at Cleveland, has been advised through the medium of a letter sent by the secretary of war to Congressman Beidler that the suction dredge Burton, designed for service on the great lakes, would leave the Delaware river for the great lakes on Oct. 15. It was at first supposed that the dredge had been definitely appointed to work in the Delaware river but it appears that it was sent there for the purpose of being tested. Maj. Kingman has received certain data from Capt. J. C. Sanford, the government expert on dredges, to the effect that on Oct. 3 in a working day of twelve hours the Burton dredged 6,180 cubic yards of material and conveyed it to the dumping ground one mile away. Owing to the fact that it was working in shallow water it could at no time carry more than a two-thirds load. It dredged 815 cubic yards an hour actual working time throughout the day. The nature of the material in which it worked is not stated.

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The Corrigan steamer Iron Chief sank off Point Au Barques last week. The breaking of her stern pipe caused the steamer to fill and sink. The Iron Chief was towing the barge Iron Cliff at the time and when it was seen that there was no possible hope of saving the steamer the barge was brought alongside and the crew transferred. The Wilson Transit Co.'s steamer Carnegie was sighted and summoned and endeavored to tow the crippled steamer to Harbor Beach, but the Iron Chief sank on the way. She was one of the old wooden boats and was built at Detroit in 1881.

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During a heavy fog last week the Canada Atlantic liner Ottawa, bound down, collided with the steamer Midland Queen of Caribou island, Lake Superior. Several plates on the starboard quarter both above and below the water line were damaged on the Ottawa but she was able to proceed on her voyage. The Midland Queen was compelled to return to Sault Ste. Marie for an examination of her injuries.

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## MR. THORNDYKE'S ADDRESS

Mr. G. F. Thorndyke of the Globe Navigation Co., Seattle, Wash., made an interesting address before the Merchant Marine Commission while it was in that city in which he outlined the distressing condition which the American ship has to face at the present time. He did not advocate any specific form of government relief but said that unless some form of relief came quickly the American flag would disappear from the high seas. His address was as follows:

"Where did the American vessel stand in the lumber trade of 1898? By following down the long list of customs clearings for the months of January, February and March of 1898 you will find hardly a single entry for the clearance of a foreign vessel. Previous to the close of the three months stated, over 90 per cent of lumber cargoes had been exported in American vessels; but by this time the trade commenced to interest foreign tonnage, for, early in April, 1898, there began an active competition for our foreign lumber carrying trade. During the succeeding nine months of 1898, foreign competition was so keen that the American vessels' average of 90 per cent (for the first three months of 1898) was cut down to 57 per cent of the total tonnage carried, by the end of that year.

MR GEORGE F. THORNDYKE

"The percentage by flags of tonnage carried for 1898, were as follows:

"American, 57.60 per cent; British, 25.42 per cent; Chile, 6.38 per cent; German, 4.45 per cent; Norway, 3.13 per cent; Danish, 1.18 per cent; Persian, 0.95 per cent; Italy, 0.52 per cent; French, 0.27 per cent; Russian, 0.08 per cent. The American vessel has held her position in the trade named, and why? Because the trade is unattractive to foreign cargoes and usually smaller than will interest foreign vessels; besides, usually there is slight chance of return cargoes from these countries; hence, when analyzing the exports as a whole, and for the purpose of showing the American vessel's position in relation to foreign trade, cargoes destined for Mexico, Central and South America, and the islands of the South Pacific must be eliminated; we then find that American vessels carried to foreign countries in competition purely with foreign vessels of all nations, only about 9.85 per cent of the aggregate board feet of lumber exported.

"In the year 1903 our shipping records show that there was exported from the Pacific coast to foreign countries an aggregate in excess of 785,000 tons of wheat, barley, flour, etc.

"The customs records show the departure from Pacific coast points of an aggregate of 230 vessels for the year, 119 of which were British, 78 French, 22 German, and one only was American; the balance being made up of vessels sailing under the flags of various countries.

"We therefore have before us the cargo tonnage of this fleet and the spectacle of British vessels carrying in excess of 54 per cent of the aggregate, French vessels in excess of 30 per cent, German vessels in excess of 9 per cent; while American vessels carried only 0.45 per cent—verily, a spectacle for gods and men!

"It is a well-established fact that American wooden sailing vessels, built in the Atlantic coast yards late in the 70's and early in the 80's, and averaging a net tonnage of from 2,000 to 2,200 tons, cost in round figures $145,000 each. About that time foreign owners commenced the construction of steel sailing vessels of about the same tonnage, costing in round figures about $45 to $50 per ton, or a maximum cost for a vessel as described of about $90,000 to $100,000.

"Immediately, American wooden vessels were completely outclassed in competition for trade; the American vessel, with her greater initial cost, her greater cost for up-keep, and her greater cost for crews and subsistence, began to disappear from the foreign grain carrying trade. When it was found that American wooden vessels could not and did not compete, for a while an experiment was tried of building American steel sailing vessels, but it was immediately found this course would not work, because such steel vessels built in the United States cost much more for construction, yet were not more effective than British vessels; thus, ultimately, American vessels were forced out of the grain trade, and today are completely shut out from the bulk grain carrying trade originating on the Pacific coast.

"Do not understand me as claiming that vessels of foreign nations engaged in the trades previously outlined are all making money; but, to the contrary, it is my opinion in many cases that foreign vessels competing as shown are losing money heavily, upon a 'dog in the manger' policy of neither making money for themselves, or allowing American owners to make money.

"Earlier herein I stated that this competition is unfair, and I reiterate its unfairness; a foreign vessel comes here, and must again go home; rather than go home with empty hands, she preys upon our markets and accepts cargo at any rates that will merely secure the business.

"For illustration, take the case of the large British steamer 'Caithness,' which arrived on the Pacific coast a short time ago from Oriental ports, seeking United States government cargoes of lumber for Manila. It just happened that it was expedient to give this lumber cargo to American vessels; so, after the Englishman's disappointment, what does he do? He raked the market with a fine-toothed comb from San Diego to Puget Sound and ultimately found that by offering a ridiculously low rate, he could secure a cargo of lumber from Puget Sound to Shanghai, China. The normal rate on lumber to that port for steam vessels is 40s to 45s, and sometimes 50s. What did the owners of the 'Caithness' then do? In order to interest shippers to an extent that would give the necessary

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dispatch to enable their vessel to leave here as soon as possible, they slashed the rate to 27s 6d. It is impossible under any conditions for any ship of any flag to make a profit on the business named at such a figure.

"Some radical prescription is now in order toward curing the present condition of the American carrying trade, and it should be administered quickly and in large doses in order that American vessels can continue existence even, and to an extent proper and commensurate with our national greatness. It does not matter so much how the assistance comes, but it must be governmental in its character. If proper assistance does not come and present conditions are permitted to continue, the competition of foreign vessels will 'break' every American company engaged in the over-sea bulk carrying business. I do not consider that I am competent to suggest what the method or character of desired assistance shall be; yet I would suggest a failure to see wherein a discriminating duty in favor of American vessels as against foreign vessels will be of material assistance; for instance, suppose that the duty on a large number of bulk cargoes of coal arriving on the Pacific coast from Australia were to be refunded! The average cargo would probably not exceed 1,500 tons, which would mean an average rebate to an American vessel (were she fortunate enough to secure such cargo) of only about $900. What good is to be found in government assistance amounting to only $900 for a vessel that has been on a seven to eight months' voyage? So little as to practically amount to next to nothing at all. In order to adequately protect an American vessel of 1,000 tons on such a voyage, governmental assistance resulting up to nearly $2,500 would have to be added to her freight earnings. It is further suggested that we can hardly see wherein American vessels would be adequately assisted if an export bounty accrued to their benefit; in fact, for the practical exploitation of any method, excepting one constantly accruing per 100 miles (to every American vessel which sails over the 'blue water') it would seem absolutely necessary for a government ship subsidy sufficient in extent to cover and protect vessels at present operating in the foreign trade and to provide for vessels Americans must build in order to replace their depleted fleets.

"There are some small reliefs that can easily be affected, that at the present time serve to burden American vessels. For instance, the tonnage tax; while a comparatively small item, yet when an American vessel is homeward bound from a seven or eight months' voyage and has to pay 6 cents a ton in order to enter her home port, it becomes quite a burden. Again, it might be arranged so that foreign vessels must pay certain fees in our ports which they do not at present pay; there is hardly a foreign country in the world of any importance wherein vessels do not have to pay light dues, harbor dues, and compulsory pilotage; while we have none of those charges in American ports. While as before stated, such a course will be a small thing, yet it will have a tendency to compel the foreign vessel owner to somewhat increase his rates in competing for business. Another thing that might be done, that will be of vast service and assistance to American vessels, is the further restriction to the placing under American register of foreign built vessels; it would seem that the process of placing a foreign vessel under the American flag is a very easy one; the method now employed should be thoroughly investigated, which will doubtless show that it would be far more desirable for the interests of American vessels for legislation, etc., to become effective whereby greater difficulty shall appertain to foreign vessels gaining the privilege of sailing under the American flag. Board of survey requirements of merely a nominal valuation to start with, thereby making the percentage of American work ordered by law, to be very small accordingly, simply permit foreign built vessels (of much less cost to construct but just as effective as similar vessels of American build) to come into ruinous competition with our American vessels. For instance, there are lying in the harbor of Seattle today, seven steamers, which at different times have been engaged in the coastwise Alaskan trade—some of them for a period of years; these vessels are thus 'laid up' today because of their having been forced out of business; the following illustration makes this plain:

"First voyages from Seattle for Nome, Alaska, in the present season of 1904 consisted of an aggregate of 14,818 registered tons; of this list 8,298 tons were old foreign built vessels —that is to say 56 per cent of the tonnage stated; three of said vessels have been purchased here within the last seven or eight months at an alleged gross cost to owners of a sum far insignificant for the three in comparison with the original cost price of the steamer Senator—one of the most costly of the American built vessels in this trade; yet each one of the three foreign built vessels is just as effective as is the first-class new steamer Senator, of very high cost. The three vessels referred to were driven out of the Pacific coast-China trade by foreign competition, incidental to their antiquity, and, as all vessels on the Pacific coast do when driven out of foreign trade they commenced at once to prey upon the coastwise business; strange to say that out of the aggregate stated of 8,298 tons of foreign built vessels, it is commonly reported that not one of them passed through the regulations presumed to pertain to vessels seeking an American register; it is well known that the United States government has passed laws covering this contingency, but more must yet be done. Every step made after the commencement of proceedings toward admission of foreign built vessels to American register, particularly everything incident to the appraising of values and of repairs made, should be conducted by regularly appointed and responsible government officials. If this is done, and the regulations fully carried out, there will be much less trouble with this kind of competition in the future.

"If the government would withdraw the fleet of transports now in operation to the Philippines (also sometimes operated to coastwise ports) such action ought to work incalculable good provided fair distribution of business is made among American vessels; it is exceedingly disheartening to observe a government transport calling at our Pacific coast ports and carrying forward from 9,000 to 10,000 tons of cargo or in some instances from 3½ to 4 million feet of lumber three or four times a year, especially when American vessels are lying idle and seeking cargoes.

"It is quite commonly stated that a full-rigged American sailing vessel customarily leaves in her home port for general trade about $5,000 per voyage; from this point of view it would seem that if the generality of American tradespeople and mechanics understood accordingly, they would readily see the benefits obviously accruing therefrom incident to operating a largely increased number of American vessels. The foreign owned vessel buys practically nothing in American ports; such vessels are stocked and stored at their home port or other initial port of departure with supplies for the round voyage, intended to last, in principal items, until arrival home. Be it the case of a sailing vessel, it is contemplated that eighteen months will be consumed until the vessel returns to her home port; or in the case of a steamer, it is expected that she will be away from her home port for eight or nine months."

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The steamer Admiral, which burned to the water's edge at Montreal last week, possessed peculiar historic interest for Americans. The steamer was built in the early 60's at the Brooklyn navy yard and was used by President Grant during a tour of Central and South American countries. The arm chair used by Gen. Grant on the trip was on the boat when it burned as was also the old chinaware with the flag of the United States and Spain intertwined in the decoration. The vessel was sold in 1882 to the North American Transportation Co. for service between Montreal and Quebec.

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## TRIALS OF A MARINE ENGINEER

After a visit to one of our largest engineering plants in New York, I came to the decision that the stationary engineer's life, compared with that of the marine man, must indeed "be a happy one," and infinitely more so when trouble comes in the form of a breakdown. The stationary engineer usually has a fine roomy place to work in, every facility for doing a repair, plenty of spare gear to be had, fresh air in abundance, and last, but not least, a steady foothold. In a steamer it is seldom there is a square foot more room than is necessary allowed for the machinery. The main engines have just enough clearance for the attached pumps to work and allow for overhauling; while the independent pumps and other auxiliary machinery are built into various corners of the engine room. Every ship carries a certain amount of spare gear but there is no set rule as to what each ship shall carry—it usually rests with the owners and the length of the voyage. As it is always the unexpected that happens, the marine engineer often finds he hasn't the spare gear necessary to repair a breakdown and has to devise some ingenious method of repair with the gear he does have. As few ships carry milling machines or lathes this sometimes calls for mighty long spells of horsing with the hammer, chisel and file.

Again, at sea the engine rooms are none too cool at any time, being ventilated by air chutes leading from cowls on the upper deck. These supply, or are supposed to supply, sufficient cool air to keep the engine room at breathing temperature. These are fairly workable while the ship is forging ahead but let her slow down or stop and the temperature climbs up a matter of twenty or thirty degrees and the sickening oily smell gathers in full force.

If it is a breakdown the ship may be stopped a couple of hours or a couple of days, but there is no letting up. Snatching a bite of food when they can, the engineers labor on—the perspiration oozing through their overalls—day into night, night into day, till at last the repair is finished and the throb of the engines is as sweetest music to their ears.

In the larger class of ships there is usually an alarm bell in the engineer's quarters controlled by a push button down in the engine room. Some of them have also a powerful electric lamp which flares up when the bell is rung. This bell, or gong, is one of the first things called to the notice of the junior engineer making his first voyage with this injunction: "If ever you hear that bell ring, *get down below*, no matter what you're doing at the time—what clothes you've on or haven't on—get down; and don't be the last man, either!"

I well remember when I first heard an alarm bell ring at sea. It was about my second trip, and there had been no necessity for ringing the bell since I had joined. One afternoon we were bowling along at a good twenty-knot clip, homeward bound. The engineers off watch (we had a large staff), were passing the time as they thought best—some reading, others writing and one or two on deck. Suddenly a terrific whirring noise was heard in the alleyway just outside my room. I was lying on the settee when it started and it was a few seconds before it struck me this was the alarm bell—but there wasn't much bell about it—talk about the devil's tattoo! Hastily pulling on a pair of shoes I stepped out and joined the other engineers hurrying along to the engine room door. At a trot we crossed the "tops" and ran down the ladders, the chief, a nimble man for his size, well in the lead. On arriving at the bottom platform we found everything as usual. The engineer in charge was making entries in the log sheet at the desk, and a few paces from him the junior engineer was superintending the oiler and cadet washing down the columns and bulkheads with a hot water hose. The chief gazed in astonishment on this peaceful scene, then advanced on the man at the desk.

"What's the matter, Dickson?" said the old man.

"Nothing the matter down here, sir," said Dickson.

"Then who in blazes rang the alarm?"

"Don't know, I'm sure, sir. I didn't."

The chief gazed on his trusty followers who had gathered in a motley group round him, and said he'd swear he heard the bell. The followers by this time were wrathful and ready to swear to, or at, anything. During this time the oiler, who had been hosing down, was getting particulars from a junior. "An' where is the button placed?" he inquired. The engineer pointed to a corner where the electric light threw a deep shadow and the oiler, casting an uneasy glance in the direction of the chief, said, "Lord, we've bin playin' the hose in there for about ten minutes!"

Then the secret was out, and after expressing his opinion of the oiler in general terms, the chief headed the procession upstairs. But there are times when the bell rings and we get below to find the engines slowed down and a hasty, but none the less careful, inspection being made. The chief holds a consultation with his senior assistants and they decide to stop. Then the steam is shut off and the jacking engine, used for turning the engine in port, is put in gear. This not only turns the engine to the most convenient position for the work in hand but acts as a check on any possibility of the wash of the sea on the propeller turning the engines. When the engine is in position a brake strap on a coupling on the tunnel shaft is tightened up to further secure the engine and the work proceeds. A guard is placed at the engine room door, as the clink of tools, the heavy thud of the flogging hammer and the rattle of the blocks only tend to whet the curiosity of the inquisitive passenger. But the work goes on apace below while the ship lies wallowing in the trough of the sea. All the men who can be spared, are in from the boiler room to lend a hand. As the ship is rolling heavily, any gear not lashed fast is liable to take charge and damage any stray limbs in its path. Bags and old mats are spread on the greasy floorplates to prevent the feet slipping from under the man swinging the hammer. A lurch of the ship will occasionally throw him off his balance, so we keep at a respectful distance with one eye on the job and another on the hammer. The man at the vise, too, finds himself sliding away from his job one minute, and lying up against it the next, so that his chipping and filing are by no means artistic work.

We work by day as well as night in artificial light, as few rays of sunlight penetrate below the cylinder platform.

These are only a few of the difficulties the marine engineer has to contend with in a breakdown—but are they not enough?

X. Y. Z.

## PERSONAL

Rear Admiral George W. Melville, formerly engineer-in-chief of the navy, and John M. MacAlpine have opened offices at No. 615 Walnut street, Philadelphia, as consulting engineers and naval architects.

GeorgeWarrington, founder of the Warrington Iron Works, Chicago, has become superintendent of construction in the United States lighthouse service at Washington. His appointment made it necessary to incorporate his business, which will be operated in his name during his absence.

Mr. H. E. Lewis of the firm of Lewis & Hughes, dealers in wholesale Pacific coast lumber with main offices at Seattle, Wash., and branch offices at room 907 No. 18 Broadway, New York, has just returned from a trip abroad where he visited nearly all the principal ship yards on the river Clyde. He found that most of them were only running on one-half capacity. Considering the fact that nearly all ships of Britain are built of steel he says that there is a fair demand for Oregon pine for decking and spars. The firm of Lewis & Hughes makes a great specialty of catering to ship builders both in this country and abroad. Mr. Lewis has now visited personally every ship yard in the United States and Great Britain, and has greatly aided to extend the business of the firm by personal contact with the ship builders.

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## SEEN AND HEARD ON THE LOOKOUT

Horace Walpole instructed us that "a people chiefly engaged in the pursuit of trifles is declining." Believers in the truth of Walpole's assertion would wonder at the lack of any evidence of decline among those Long Islanders whose occupation is the pursuit of such trifles as clams and scallops. A story has been told of a city youngster who, when temporarily boarding in the country, refused to drink milk on the ground that, having been accustomed to purchase milk at a clean store, he objected to swallow a substitute squeezed from a beastly cow. And upon the arrival of a scallop sloop at the wharf in Sag Harbor a fireman of the New York steamer, pointing to the "catch," inquired of the bystanders: "What bait do they use for thim clams?" Unlike the poor, who are with us at all times, scallops are only allowed to be in evidence during certain parts of the year, and commencing from Sept. 1, almost any small sailboat along the shores of Peconic Bay must needs become a member of the scallop fleet..

For the benefit of the uninitiated in the "modus operandi" of catching scallops, it may here be stated that, as in the case of oysters, dredges are used in the gathering of this table delicacy.

As in the case of lobsters, laws have been enacted for the purpose of preventing the extinction of the scallop, and the presence of the picturesque fleet of sloops and catboats in Peconic Bay, to the total exclusion of power boats, is due to a clause in the fishing laws making it illegal to dredge from motor-propelled craft. But a great deal of time is daily being wasted by the boats when fire and wind combine in a powerful opposition to their heroic attempts to arrive at the "grounds" in the morning or reach home in the evening. Sometimes half the day is over before the fleet arrives at the scallops' habitat, and as also a timely arrival off the shanty where the opening and measuring takes place in the evening is desired many scallopers are seriously thinking of installing motors in their boats.

A motor would insure their timely arrival on the spot where the daily beating to windward and drifting to leeward is a monotonous but necessary proceeding for those engaged in this manner of earning a living. Nothing is mentioned in the above-named clause of the fishing laws that would make a person liable to be fined for proceeding to and from the grounds in a boat propelled by a motor, if sails are solely used as soon as the dredges have been committed to the shallow deep. Agents of motor concerns are hereby advised that a vigorous canvassing campaign among the hardy Long Island scallopers may prove profitable to themselves as well as advantageous to the latter.

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Though one swallow may not make a summer the going out of commission of numerous excursion steamers may safely be regarded as a precursor of fall. After having securely tied a boat to the dock, covered the pilot house windows, and stowed all the bedding in the least damp place the deck department has no more business requiring the crew's services. One of the deckhands on a steamer that was being prepared for a period of inocuous desuetude, busily engaged in removing inanimate objects to places of shelter, spied the eagle still holding forth on top of the pilot house, and anxiously inquired of the captain: "May I take down the birred, sir." For the benefit of the ultra-humane among your readers it may here be stated that this particular bird was taken down, though on other boats eagles could still be seen in their unreasonably aggressive attitudes perched above stripped decks. It requires a few more days—or, perhaps a week—for the firemen to add the finishing touches to what in the parlance of the engine room is comprised in the term "laying-up," and then the shipkeeper takes charge—the personification of solitude, and a $40 per month living testimonial to the exactions of an insurance company. Said shipkeeper, during the first days of his incumbency, generally removes all the life-preservers from their customary places to build a pyramid of them in the 'tween decks. Incidentally, the wisdom of said removal may be questioned in many instances; their wonted places of occupancy being as a rule most conducive to the longevity of their indolent existence. Anyhow, there they are piled up, and if the shipkeeper has the forethought to cover, or turn the lifeboats keel-up, beyond an occasional operation with a snow shovel on the upper deck, his life may be passed in ease and splendor. Permitted to select a bedchamber from a bewildering assortment of apartments, occupying the captain's chair at the head of the saloon table when partaking of a meal, and assured of the receipt of a monthly check embellished with the signature of some soulless corporation's official —"who would not be the shipkeeper?"

"Keep off," and "beware of the dog" notices are now displayed above many gangways; chains have been substituted for manila hawsers, and the sight along basins and wharfs where excursion craft are in the habit of passing their time of idleness is indicative of the advent of winter. Let it snow!

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Since the so-called "Slocum disaster" manufacturers of life-preservers have been doing a rushing business, and solid blocks of cork, never the granulated variety, were ordered in all cases. Boat drills on board excursion steamers have been the rule instead of, as formerly, the exception. Having now seen to it that next season the lives of excursionists shall be as safe as the application of beneficient laws can make them, the authorities might overhaul the ferryboats, or rather, some of the laws regulating their operation. For instance, without indulging in a discussion as to the quality of the life-preservers carried on the Slocum, the quantity was according to law, and sufficient to provide every soul on board with one at least. But the ferryboats are regarded as "a continuation of an established highway," and though the traversing of this damp continuation may be as perilous as an ocean trip the number of life-preservers need not exceed that of the *average* number of passengers carried per trip.

And now let us do a little figuring! Suppose a ferryboat makes six trips daily, carrying 500 persons on the first and 500 on the last trip. On the four remaining trips she carried sixty each time, or 240 persons, and thus transporting 1,240 passengers during the day. According to the law on this continuation of the highway only 207 life-preservers are needed and should an accident happen during the morning or evening "rush hours" the hundreds of passengers necessarily unprovided with lifebelts may soon become conscious of the abrupt discontinuation of what the law termed an established highway. Can you swim? F. H.

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The steamer Sitka of the Gilchrist fleet went on the rocks off Point Sable, Lake Superior, last week. The life saving crew from the Grand Marias station rescued the crew. The lighter Rescue was sent to her assistance. The Sitka was bound down with a cargo of iron ore. She is 272 ft. long, 40 ft. beam and was built at West Bay City in 1887.

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The storm on Lake Superior last week was unusually violent and Capt. Martin of the Anchor liner Tionesta is responsible for the statement that he was able to look down the smokestack on one of the Steel Corporation freighters which rolled so in an endeavor to seek shelter. Capt. Martin's reputation has hitherto been blameless.

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The steam schooner Cascade building at the yard of H. D. Bendixsen, Eureka, Cal., for C. S. McCormick & Co., was launched last week. The Cascade is 173 ft. long, 36 ft. beam and 12½ ft. deep. She will be towed to San Francisco where her machinery will be installed by the Fulton Iron Works.

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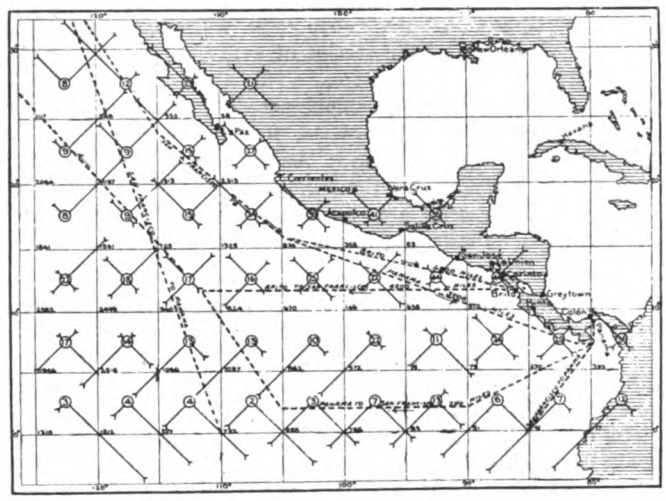
## THE SAILING SHIP AND THE PANAMA CANAL

Mr. James Page of the United States hydrographic office contributed some little time ago to the National Geographic Magazine a most excellent article upon the Panama canal with especial reference to its use by the sailing ship. After submitting figures to prove that the sailing ship is not disappearing from the seas as is commonly supposed, 28 per cent of the world's tonnage being sail, he says that a better understanding of ocean meteorology has contributed to the profitableness of the sailing ship of late years and then enters



WINDS, CALMS AND SAILING ROUTES, MAY—OCTOBER.

into the heart of the subject which is the sailing ship with especial reference to the carriage of freight through the Panama canal. This portion of his article is given without abridgement as follows:

A factor by no means generally recognized, but of vast importance to profitable navigation by sail, is the better knowledge which we are gradually acquiring of the meteorology and physical geography of the sea. The era of record passages is closed, and sailing ships are no longer urged to their utmost speed in the hope of outstripping a rival, even at the sacrifice of cost and safety. As a consequence, the study of the winds and currents of the sea has not the vital interest which it possessed in the days of Maury, when the relative performance of the Sea Witch, the Dreadnought, the Invincible, the Oriental, and other like fanciful named craft was a matter of international discussion. The investigation has, however, gone earnestly forward, and the sailing ship has reaped the benefit in the shape of greater security, quicker passages, and larger profits. First among the national institutions interested in this work is the Deutsche Seewarte, having its central office in Hamburg, Germany, and a single instance will serve to show the practical value of the results which have been accomplished in this direction. The exportation of saltpeter from the nitrate ports along the west coast of South America to Europe is handled exclusively by German sailing ships, and the best sailing route from the English channel to the coast of Chile and return has since the inception of this trade been made the subject of special investigation by the Seewarte. As a result of this study the time of passage has steadily diminished. During the early 70's, the epoch at which the trade first became active, the voyage from the Lizard to Valparaiso occupied over 100 days. Careful discussion of the material meanwhile accumulated, leading not so much to change in the route as to more intelligent handling of the vessel by the shipmaster under given meteorological conditions, has succeeded in reducing this time materially, the successive steps of the improvement being as follows:

1876-1880, 18 passages; average time, 102 days.
1881-1884, 38 passages; average time, 91 days.
1885-1888, 64 passages; average time, 88 days.
1889-1892, 83 passages; average time, 83 days.

With this much said in support of the claim that navigation by sail is still a factor in freight transportation, fulfilling in the case of a long voyage a sphere for which the steamer is ill-adapted; that it even has a future of increased usefulness before it, and that its interests must be considered in any broad scheme whose aim is the promotion of the world's commerce, the question of the value of the proposed interoceanic canal from the point of view of the sailing ship is worthy of consideration.

Although not so unfortunately situated in this respect as the Suez canal, where the Red sea, with its strong monsoon winds, numerous shoals, and intricate passages, interposes an insuperable obstacle to navigation by sail, the neighborhood of the proposed American canal is by no means free from difficulty. The whole Isthmus from Tehauntepec eastward to Colombia lies within the tropics, and the climate exhibits the characteristic tropical feature to a marked degree. The year is divided into two seasons, the wet and the dry, the former lasting from May to December, the latter from January to April. In the vicinity of Colon (latitude 9° 22′ N., longitude 79° 55′ W.), the Atlantic terminal of the canal, and of Panama (latitude 8° 55′ N., longitude 79° 31′ W.), the Pacific terminal, the average annual rainfall amounts to 125 inches and to 47 inches respectively, distributed throughout the several months as follows:

| | Colon. | Panama. |
|---|---|---|
| January | 1.9 in. | 0.5 in. |
| February | 1.5 " | 0.0 " |
| March | 1.3 " | 0.2 " |
| April | 2.7 " | 0.9 " |
| May | 11.6 " | 5.3 " |
| June | 13.9 " | 5.2 " |
| July | 14.3 " | 4.5 " |
| August | 14.9 " | 5.7 " |
| September | 12.6 " | 7.3 " |
| October | 13.8 " | 6.9 " |
| November | 23.6 " | 5.6 " |
| December | 12.2 " | 4.8 " |
| | 124.3 | 46.9 |

At both places the average monthly temperature is 79° Fahrenheit, the variation from month to month being insigni-

WINDS, CALMS AND SAILING ROUTES, NOVEMBER—APRIL.

ficant. The extreme temperatures are 68° and 95° Fahrenheit. The relative humidity is of course excessive, ranging from 90

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per cent during the early forenoon hours to 75 per cent during the afternoon.

With regard to that feature of the weather most essential to navigation by sail, viz., the winds, the northeast trades blow home to the Caribbean coast throughout practically the entire year. They attain their greatest force and their most northerly direction during the dry season (January-April), and it is during these months that along the eastern coast of Central America the dreaded "northers" occur—storms which give so little warning of their approach and blow with such dangerous violence that steamers calling at Colon are invariably required to keep up steam in order that they may be able to slip their cables and put to sea at a moment's notice. As the wet season advances the trades weaken in force, at the same time inclining to southeast; and at its height, during August and September, brief periods of southwesterly winds occur, these, however, being no longer the northeast trades of the Atlantic, but the prolongation of the southeast trades of the Pacific, which, reaching across the equator into northern latitudes, are converted by the earth's rotation into southwesterly winds and at intervals attain sufficient force to traverse the Isthmus.

A sailing vessel approaching the coast from the eastward will thus experience but little difficulty on the score of wind. Once within the chain of islands enclosing the Caribbean sea, a straight course may in general be shaped for the entrance to the canal, and the trades, although light in force during a large portion of the year, will serve to bear her to the desired haven. Currents also will assist, for throughout the entire sea, except in the immediate neighborhood of the coast of Cuba on the north, and of Venezuela and Colombia on the south, the motion of the surface water is to the westward.

The log of a sailing vessel emerging from the eastern terminus of the canal into the Caribbean will tell a different story, the conditions which facilitated to such a degree the approach toward the port of Colon serving in like measure to embarrass departure from it. To steer a direct course in the face of the trades will be impossible, and no matter what her ultimate destination, the square rigger will find it necessary to seek an outlet from the Caribbean sea by way of the Yucatan channel and thence through the straits of Florida into the Atlantic.

In the case of vessels bound to a European or an American port such a route will not involve any very great sacrifice of distance. For those destined to points below the equator—for example, the fleet engaged in the lumber trade from Puget Sound to South Africa, one of the most important lines of traffic still monopolized by the sailing vessel—the detour, necessitating as it does the attainment of the parallel of 35 degrees in the North Atlantic in order to circumnavigate the northeast trades, will be out of the question, and these will continue to make the passage by way of Cape Horn.

As to the feasibility of the route from Colon to the straits of Florida, it may be stated that during the wet season the passage will offer but little difficulty, the trades at this time being light in force and blowing from a point well to the eastward, or even south of east. During the dry season, however, different and decidedly adverse conditions prevail. From November to April the trades along the coast are northerly or even northwesterly in direction, and frequently attain the force of a fresh gale, requiring a close-hauled ship to reduce her canvas to reefed topsails and courses. Under these circumstances the voyage resolves itself into a steady beat to windward under most trying circumstances.

Owing to the fact that the sailing traffic of the region is at present confined to fore-and-aft schooners, it is impossible to state with accuracy the delay which a vessel of large tonnage making the passage from Colon to Cape San Antonio during the winter months would thus suffer. An analogous situation exists, however, in the care of the passage up the China sea at the time of the northeast monsoon, and the reluctance with which this latter feat is attempted by sailing masters may be gathered from the fact that during the prevalence of this monsoon the bulk of east Asiatic trade from Europe and America follows the sailing route leading to the southward and eastward of Australia, the majority of captains claiming that such a circuit results in a saving of time over the China sea route, although it involves the running down of at least 3,000 miles additional distance.

### BELT OF CALMS AT THE PACIFIC END OF THE CANAL.

At the eastern extremity of the canal the difficulties which a sailing vessel may expect to encounter will thus arise from a superabundance of wind rather than a lack of it. At the western extremity, on the other hand, these conditions will be completely reversed. Upon emerging from the canal into the Pacific ocean a vessel will enter an extensive belt of calms and light airs, which render navigation by sail more tedious than in any other frequented portion of the sea.

In order to understand the feebleness of the winds throughout this region, a word is necessary as to the agency by which winds are produced. Wind is air in motion, the direction of the motion being always from an area throughout which the atmospheric pressure is high toward an area throughout which it is low, the strength of the wind at any point being within certain limits proportional to the barometric gradient or slope at that point. Where these gradients are steep the winds are strong; where they are gentle the winds are light; where they are absent, or, in other words, where the barometric pressure is uniform, the force giving rise to the winds vanishes and the air is accordingly at rest.

It is such a uniformity of pressure that exists throughout the region under consideration. Under normal conditions the distribution of atmospheric pressure over the earth's surface consists of two extratropical belts of high pressure, separated by an equatorial belt of low pressure, each of these three belts completely encircling the globe. On the equatorial slope of the high pressure belts there is a steady movement of air toward the low pressure trough which separates them, this movement constituting in the northern hemisphere the northeast trades, in the southern hemisphere the southeast trades respectively. Between these two, coinciding roughly with the bottom of the trough which separates the high pressure belts, lies a region known among seamen as the "Doldrums," characterized by moist, cloudy weather, absence of wind, and abundance of rain. The width of this region varies—at some points wide, at others narrow. In that portion of the North Pacific included between the American coast and the meridian of 120° W. it reaches a maximum, extending in latitude from a point one or two degrees north of the equator to Cape Lucas, the southern extremity of lower California. Throughout this whole region the barometric pressure is below the average and extremely uniform, ranging from 29.85 inches during the northern summer to 29.95 inches during the northern winter. Here, accordingly, barometric gradients are absent, the winds sink to stagnation, and calms prevail.

A knowledge of the general character of the winds of this region may be gathered from the following diagrams, the first holding for the northern summer (May-October) and the second for the northern winter. The figures in the center of each five-degree square show the percentage of the time (number of hours in each hundred) during which calms or light variable airs may be expected to prevail, the length of the arrow in each quadrant, the percentage of the whole time during which the wind may be expected to blow from some point in that quadrant. The figures in the lower left hand corner give for each square the total number of observations considered. No attempt is made to show the average force of the wind, but it may in general be stated that for the entire area it does not exceed three on the Beaufort scale, correspond-

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ing to a velocity of 15 miles per hour, and capable of imparting to a full-rigged ship sailing "full and by" a speed of from 3 to 4 knots.

From an inspection of these diagrams it is evident that the "Mexican Belt of Calms," as it is known among seamen, is triangular in shape, the base of the triangle lying far out in the Pacific, its longitude roughly coinciding with the meridian 125° W., near the fairway of vessels bound from San Francisco to the line. In latitude, the position of the vertex, as well as the axis of the belt, or line along which the maximum frequency of calms occurs, changes slightly with the season. From November to April its mean position is between 5° and 10° N. As the summer advances and the sun moves northward, however, the axis of the belt likewise recedes from the equator, its average position for the months May-October lying between 10°-15° north. The frequency of calms increases rapidly as the coast is approached. Immediately under the coast, however, a diminution may in some instances be noted, due to the presence of the land and sea breezes, and also to the fact that at certain points the trade wind of the Caribbean seems to reach across the Isthmus.

As to the saving of time likely to be effected by the substitution of the canal for the present route around the Horn, the figures are to some extent disappointing. The length of the voyage from the Channel to San Francisco by way of Cape Horn, following the sailing route laid down by the Deutsche Seewarte, is in the neighborhood of 16,000 miles. The average sailing time is 139 days. The return voyage, although 1,000 miles greater in distance, is made in less time, occupying but 132 days, the delay on the outward-bound passage being occasioned by the difficulty of beating around the Cape. As evidence of the importance of the traffic following this route, it may be stated that, during the year 1901-1902, 104 sailing vessels from the Channel entered at the Pacific coast ports of the United States alone, and 322 vessels cleared from these ports for the Channel.

The average sailing time from the Channel to Colon is 43 days, and from Panama to San Francisco 52 days. Allowing two days for passage through the canal, the duration of the voyage by the Isthmian route will thus amount to 97 days, as compared with 139 days by way of Cape Horn, or a net saving of 42 days. The substitution of any other Pacific coast port for San Francisco will serve only to increase or diminish the duration of both voyages to a like extent, the average sailing time to San Diego being three days less than to San Francisco, the average sailing time to Portland and Puget Sound respectively five days and seven days greater.

On the return voyage the saving in time is likely to prove considerably less. The average duration of the passage from San Francisco to Panama, as derived from the very few instances obtainable, is 55 days, while the voyage from Colon to the Channel, owing to the circuitous route which a sailing vessel is obliged to follow, occupies, under ordinary conditions, 60 days. Again adding the two days required to cross the Isthmus, the duration of the voyage from San Francisco to the Channel by way of the canal will thus prove to be 117 days, giving a saving of but 15 days as compared with the voyage by way of the Horn.

The coastwise trade between the Atlantic and the Pacific seaboard of the United States, so profitable prior to the construction of the transcontinental railways, has almost vanished from the sea, the traffic in coal alone surviving. Whether it can be revived by throwing the canal open to sailing vessels of small tonnage, coasting schooners, and the like, is a problem. The saving of time in this instance would be considerable, the duration of the voyage between New York and San Francisco by way of Cape Horn amounting to practically the same thing as the voyage from the Channel, viz., 140 days outward and 130 days homeward, while the passage from New York to Colon may be made in 20 days and the return in 28 days, giving for the total sailing time from New York to San Francisco via the canal 74 days, and for the return 85 days, which means a saving of 66 days and 45 days respectively.

## BATTLESHIPS NEBRASKA AND GEORGIA LAUNCHED

The battleship Nebraska will probably be remembered in the United States navy as the ship that launched herself. She is the product of Moran Bros. Co., Seattle, Wash., and was launched on Friday last. She slid into the water precisely eleven minutes before the time set for her launching. Governor J. H. Mickey of Nebraska and Attorney General Prout had just finished brief remarks to the assembled multitude when a great crashing of timber was heard and the battleship began to glide slowly down the incline. Miss Mary Main Mickey, the governor's daughter, was very quick in perceiving what was happening and managed to break the bottle of champagne and to christen the vessel before it had slipped past her. Fortunately the vessel went into the water without injuring herself or anyone.

The Nebraska is the first battleship to be built north of San Francisco on the Pacific coast. She is 441 ft. 3 in. long, 76 ft. 2½ in. beam and 23 ft. 9 in. draught. Her engines are of the four cylinder triple-expansion type, supplied with steam from twelve water tube boilers. Her main battery consists of four 12-in. guns, eight 8-in. guns and twelve 6-in. guns. In her secondary battery she will carry fourteen 3-in. guns, twelve 3-pounders, sixteen small guns and four 21-in. torpedo tubes. She has two superposed turrets and two waist turrets. Her sides are protected by a belt 11 in. thick and 8 ft. wide.

The battleship Georgia was launched this week at the yard of the Bath Iron Works, Bath, Me. She was christened by Miss Stella Tate, sister of Congressman Tate of Georgia. The launch was successful in every particular. She is a sister to the Nebraska.

## AROUND THE GREAT LAKES

The heavy weather prevailing on Lake Superior caused the total destruction of the steamer Sitka of the Gilchrist fleet which ran ashore on Point Sable.

The Great Lakes Engineering Works of Detroit has delivered the car ferry Transfer to the Michigan Central railroad, having made extensive repairs upon it.

H. H. Brigham, traffic manager of the A. Booth Co., announces that the company has decided to inaugurate a through steamer service between Duluth and Sault Ste. Marie next summer.

Repairs to the steamer Wyoming necessitated by fire while at Midland were completed on October 1 at the yard of Abram Smith & Son, Algonac, Mich. The Wyoming left for Detroit, where she will be docked and caulked.

The steamer Wawatam which ran on the rocks at North Point was taken to the Illinois Steel Co.'s dock at Milwaukee and unloaded. The Wawatam was quite seriously damaged and a number of plates will have to be removed.

The steamer Hiawatha while bound up the Welland canal carried away the two head gates of lock No. 1 at Port Dalhousie last week. Owing to the extraordinary efforts made by the superintendent of the canal and his assistants navigation was not seriously delayed.

While crossing from Chicago to South Haven last week the stern bearings of the steamer City of Kalamazoo of the Dunkley-Williams Co. loosened from the violent pounding of the sea and the boat began leaking. Temporary repairs were made after the boat reached South Haven.

Fire destroyed the propeller Congress and her cargo of pine lumber while lying in shelter from the storm at South Manitou island. The Congress was formerly the Nebraska and was engaged as an excursion boat during the Chicago world's fair. She was worth $30,000 and was owned by I. J. Boland of Buffalo.

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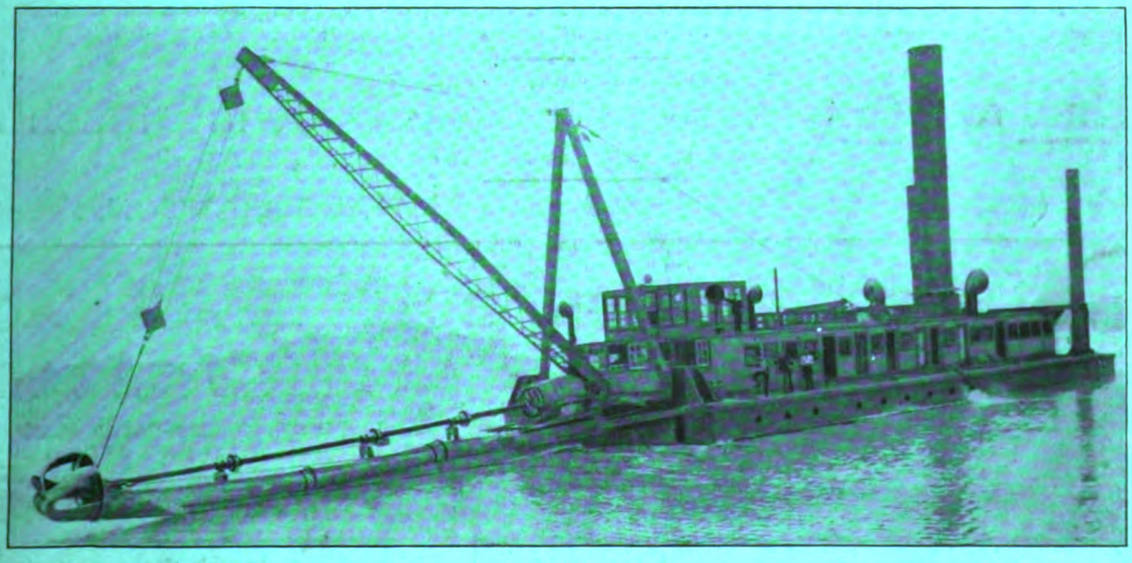

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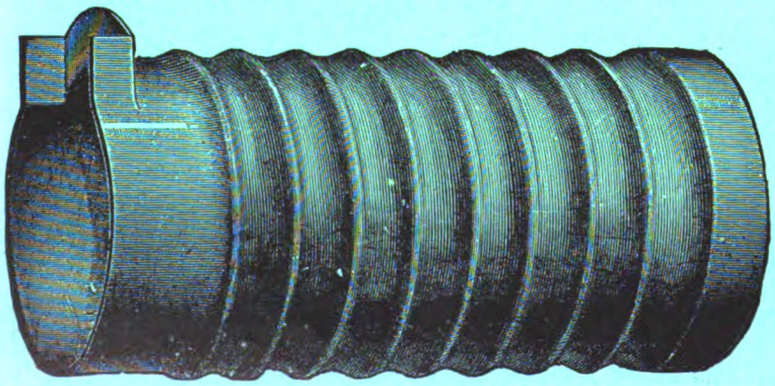

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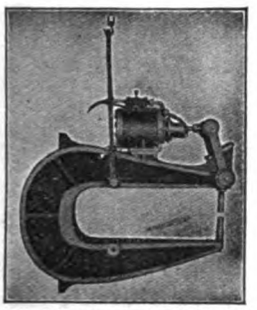

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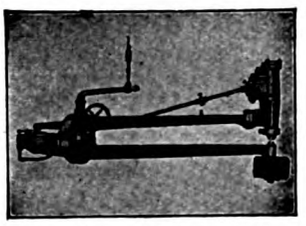

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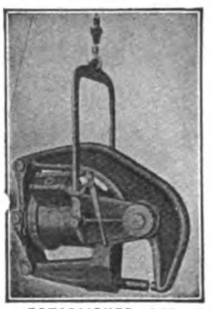

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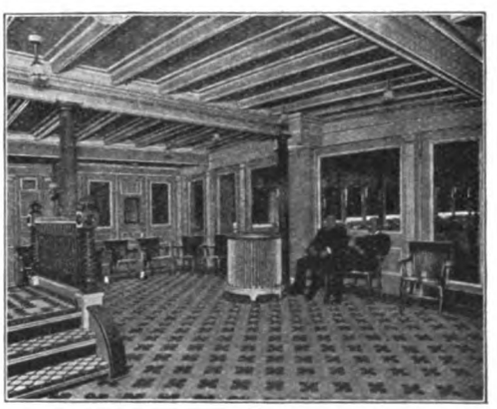

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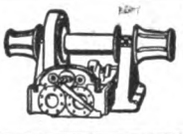

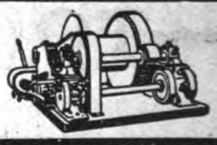

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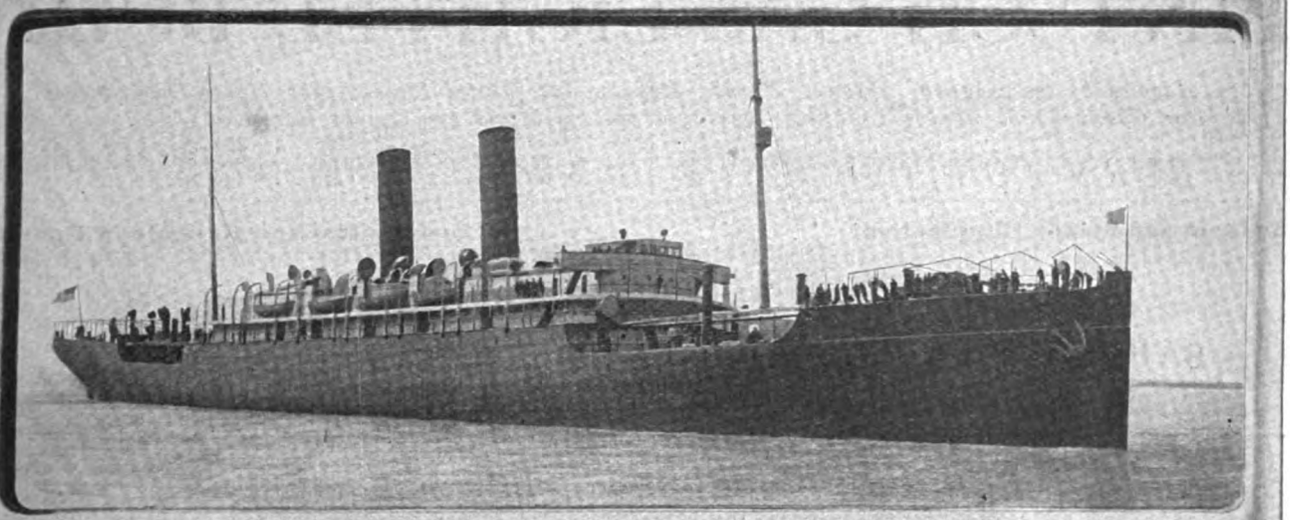

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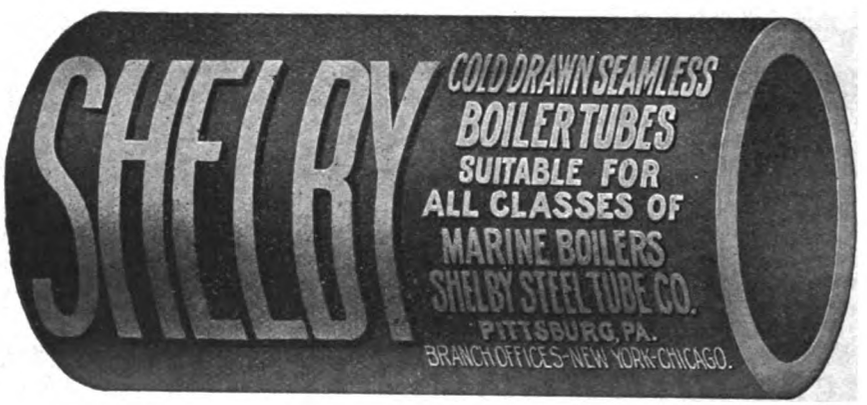


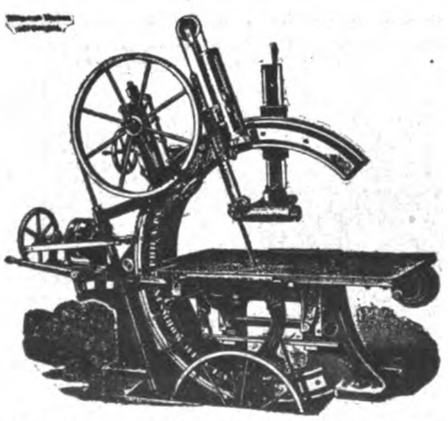

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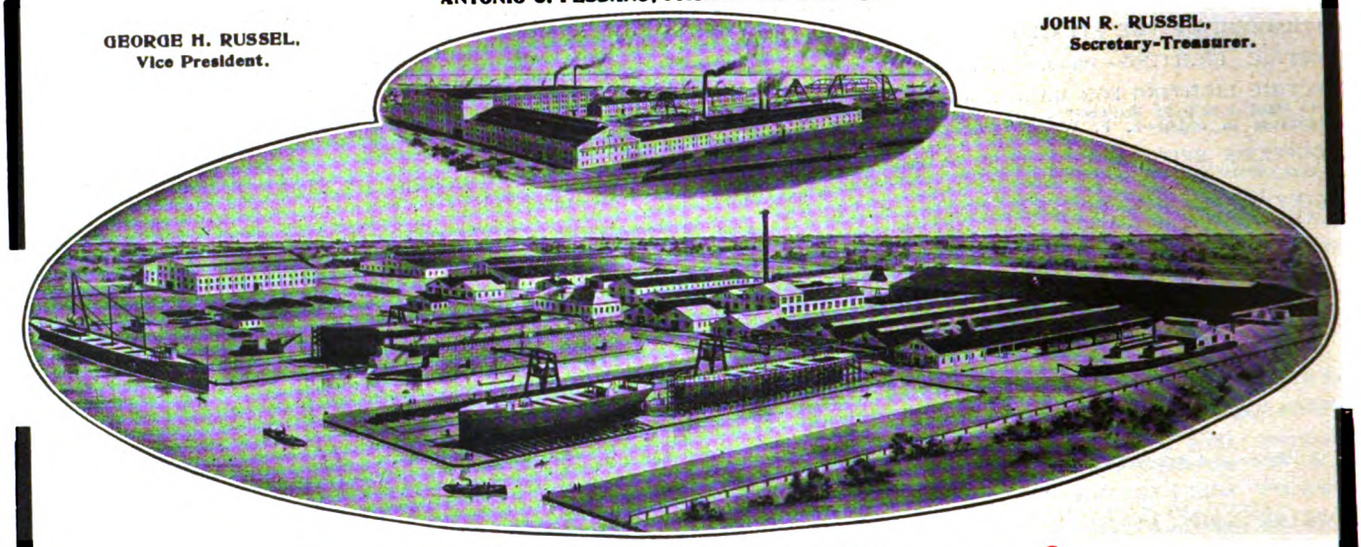

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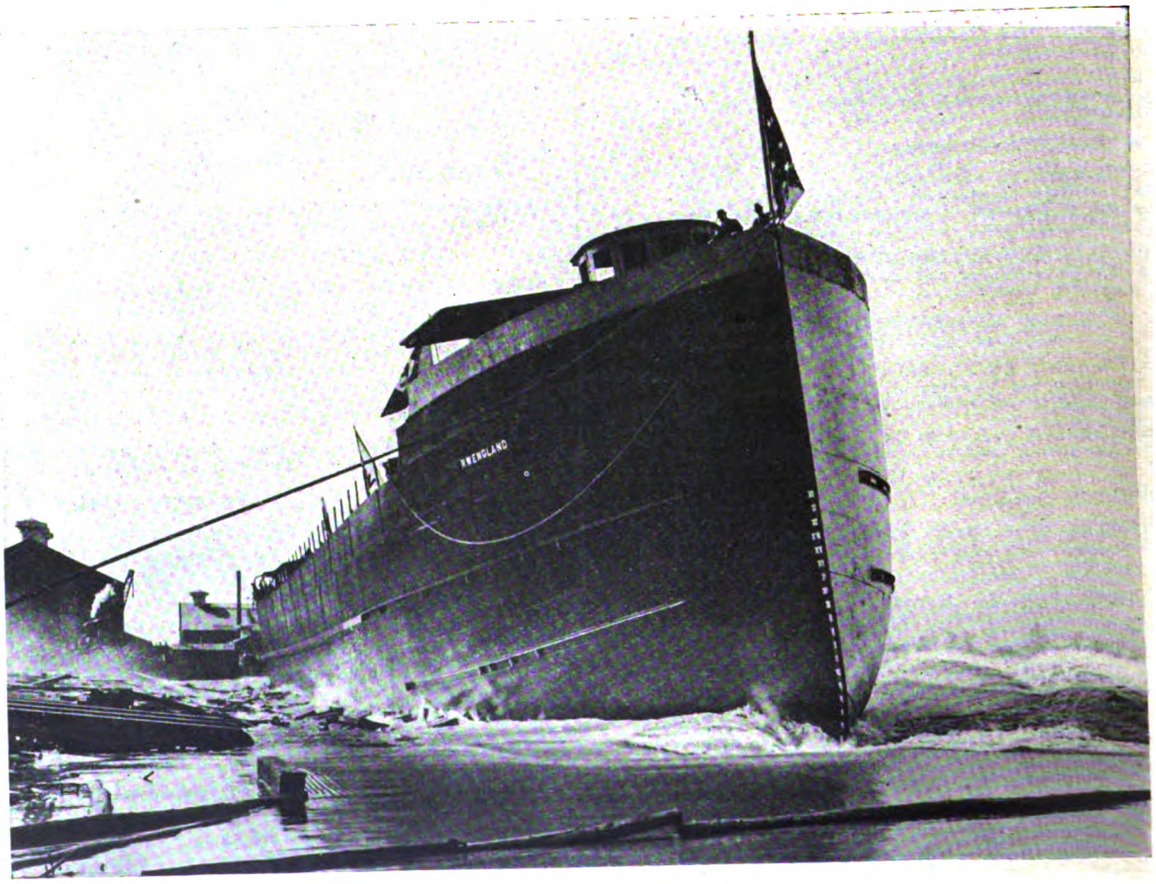

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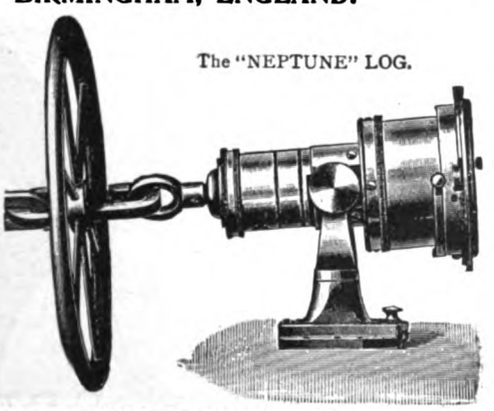

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Member of the Institution of Naval Architects and of the Institution of Engineers and Shipbuilders in Scotland; Surveyor to Lloyd's Register of Shipping. 2 vols. (Vol. I., Text. Medium 8vo. Vol. II.. Diagrams and Illustrations. Oblong 4to.)

The plan of the book is briefly as follows: First, attention is given to the fundamental matters which govern the structural design; the various stresses to which the hull is exposed, their straining tendency, and the different structural designs by which the necessary strength to resist them may be secured. Secondly, each important part of the hull is considered by itself, and each one from three points of view. viz., its purpose in the structure and the particular stresses and straining effects to which it is liable; the various formations adopted in its design, with the rules governing them as regards scantlings and strength; and a description of the actual work of making it in a shipyard and fitting it to the ship. As a description of the actual work of the shipyard is reading of a special character, it is dealt with separately in the second part of the book, the sequence generally being thus better preserved.

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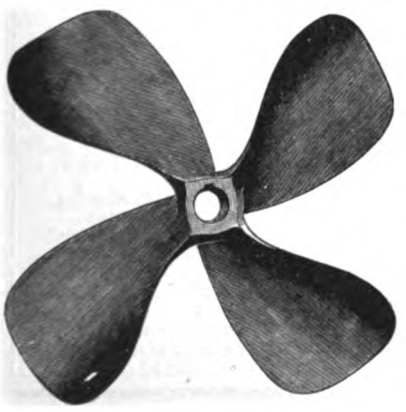

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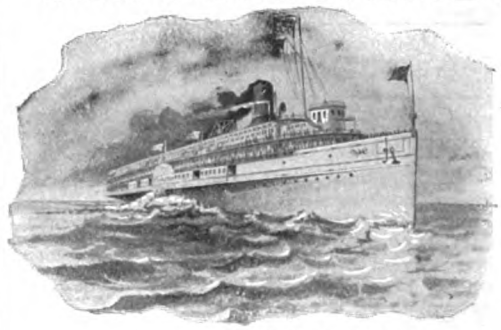

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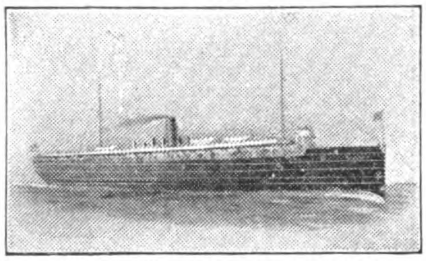

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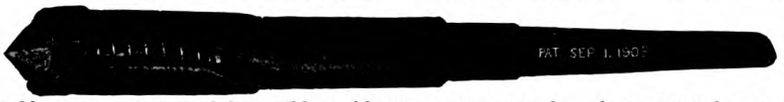

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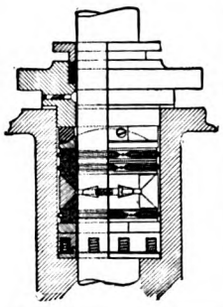

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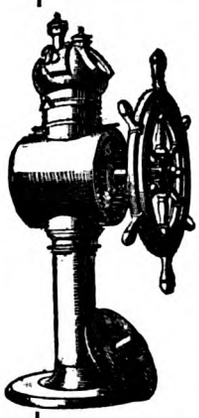

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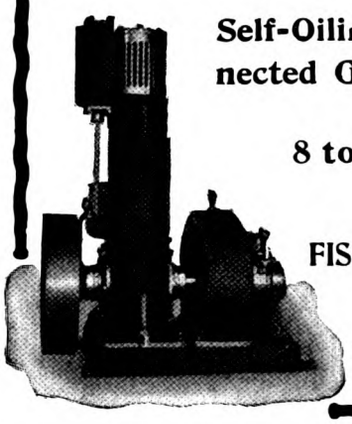

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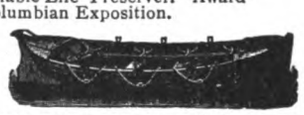

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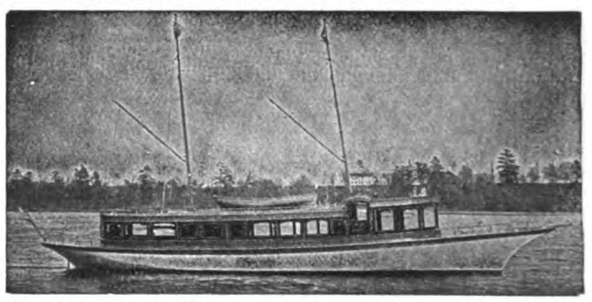

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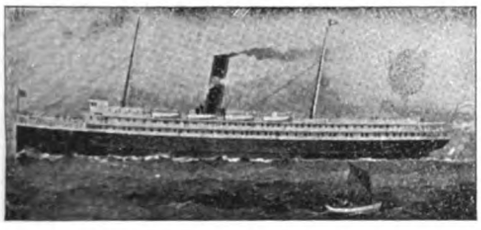

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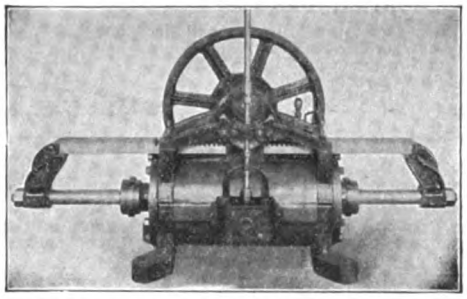

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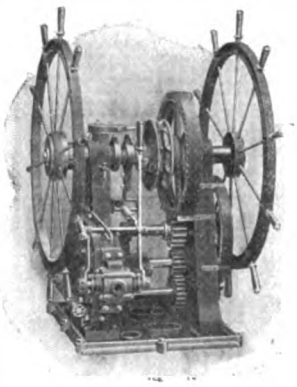

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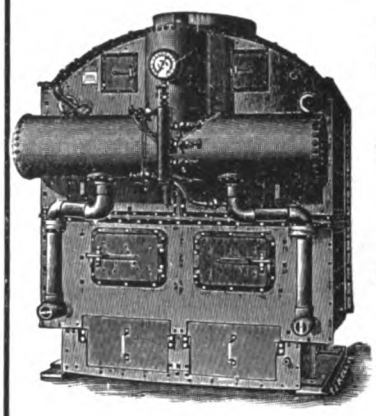

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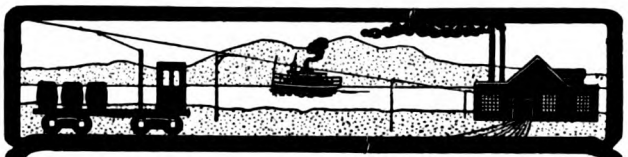

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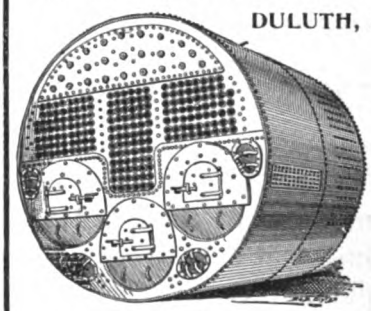

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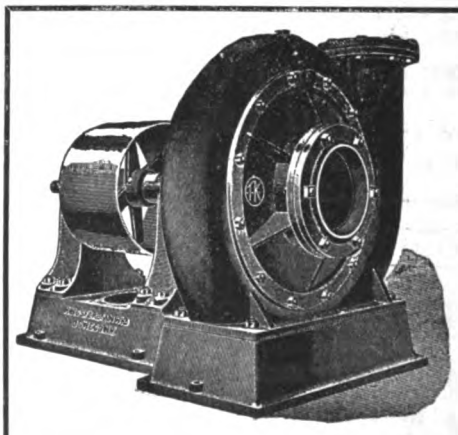

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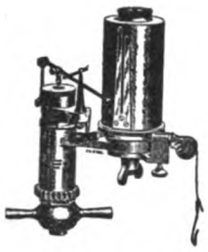

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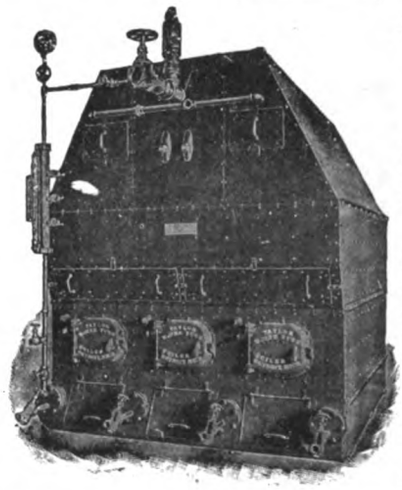

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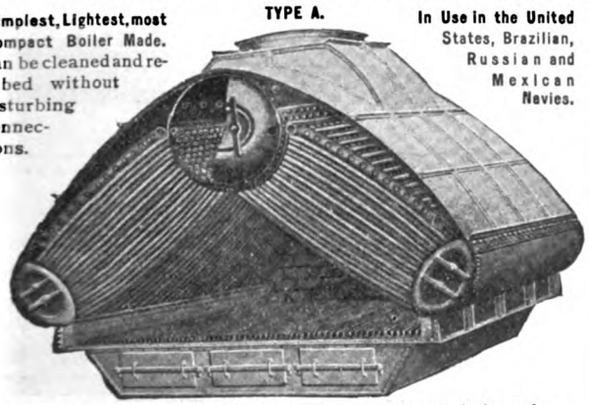

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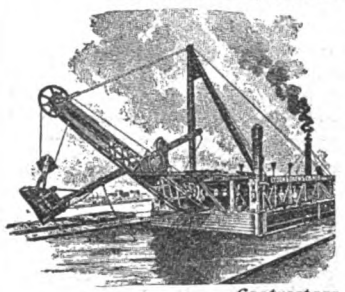

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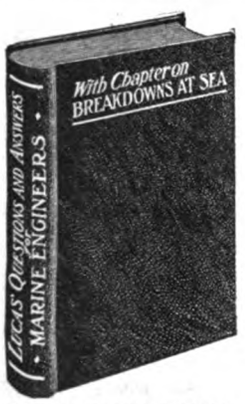


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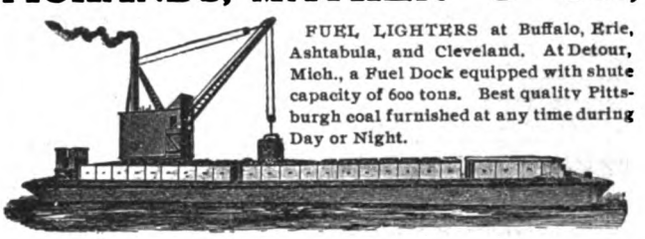

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See accompanying index of Advertisers for full addresses of concerns in this directory.

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Hanna, M. A. & Co.....Cleveland.
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..... Midland, Ont.
Marine Construction & D. D. Co.....
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Truscott Boat Mfg. Co.....St. Joseph, Mich.
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### LIFE PRESERVERS, LIFE BOATS, BUOYS.
Armstrong, Cork Co.....Pittsburg.
Dreim, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D. .....New York

### LIGHTS, SIDE AND SIGNAL.
Russell & Watson .....Buffalo.

### LOGS.
Walker & Sons, Thomas ....Birmingham, Eng.
Also Ship Chandlers.

### LUBRICATING GRAPHITE.
Dixon Crucible Co., Joseph..Jersey City, N. J.

### LUBRICATORS.
Crane Co. .....Chicago.
Lunkenheimer Co. .....Cincinnati.

### LUMBER.
Martin-Barriss Co.....Cleveland.

### MACHINISTS.
Chase Machine Co.....Cleveland.
Hickler Bros. .....Sault Ste. Marie, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Union Machine & Boiler Co.....Cleveland.

### MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

### MARINE RAILWAYS.
Hickler Bros. .....Sault Ste. Marie, Mich.

### MARINE GLUE.
Ferdinand & Co., L. W.....Boston, Mass.

### MARINE RAILWAYS, BUILDERS OF.
Crandall & Son, H. I....East Boston, Mass.

### MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

### MECHANICAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works ..Detroit.
Sturtevant, B. F. Co.....Hyde Park, Mass.

### MELTING POT AND PAYING LADLE.
(For Paying Seams of Decks with Marine Glue.)
Ferdinand & Co., L. W.....Boston.

### METALLIC PACKING.
Katzenstein, L. & Co.....New York.

### METAL POLISH.
Bertram's Oil Polish Co.....Boston

### MOTORS, GENERATORS—ELECTRIC.
Fisher Electrical Works.....Detroit.
General Electric Co.....Schenectady, N. Y.
Sturtevant, B. F. Co.....Hyde Park, Mass.
Westinghouse Electric & Mfg. Co.....
..... Pittsburg, Pa.

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# Buyers' Directory of the Marine Trade.—*Continued.*

### NAUTICAL INSTRUMENTS.
Ritchie, E. S., & Sons.....Brookline, Mass.

### NAUTICAL SCHOOLS.
Chicago Nautical School. .. ..... ... Chicago.

### NAVAL ARCHITECTS.
Hynd, Alexander .....Cleveland.
Kidd, Joseph.....Duluth, Minn.
Kreer & Parsons. .... .....Chicago.
Lovejoy, H. O.....Buffalo.
Matteson & Drake.....Philadelphia.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Rice, Henry .....Buffalo.
Sadler, Perkins & Field.....New York.
Steel, Adam .....Cleveland.
Wood, W. J.....Chicago.

### OAKUM.
DeGrauw, Aymar & Co.....New York.
Stratford, Oakum Co.....Jersey City, N. J.

### OIL ENGINES.
Mietz, Aug. .....New York.

### OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph..Jersey City, N. J.
Standard Oil Co.....Cleveland.

### PACKING.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Katzenstein, L. & Co.....New York.
New York Belting & Packing Co...New York.

### PACKING TOOL.
Matteson & Drake .....Philadelphia.

### PAINTS.
Baker, Howard H. & Co.....Buffalo.
Detroit Varnish Co.....Detroit.
Detroit White Lead Works.....Detroit.
New Jersey Zinc Co.....New York.
Upson-Walton Co. .....Cleveland.

### PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

### PILE DRIVING AND SUBMARINE WORK.
Buffalo Dredging Co.....Buffalo.
Chicago & Gt. Lakes Dredge & Dock Co.. ..... Chicago.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Hickler Bros. .....Sault Ste. Marie, Mich.
Lake Superior Contracting & Dredging Co., ..... .....Duluth, Minn.
Parker Bros. Co., Ltd.....Detroit.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H...Milwaukee.
Sullivan, M. .....Detroit.

### PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland, O.
Crane Co. .....Chicago.
Macbeth Iron Co.....Cleveland.

### PLANING MILL MACHINERY.
Atlantic Works, Inc.....Philadelphia.

### PLATES—SHIP, STRUCTURAL, ETC.
Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.

### PNEUMATIC TOOLS.
Allen, John F.....New York.

### POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.

### PRESSURE REGULATORS.
Kieley & Mueller .....New York.
Ross Valve Co.....Troy, N. Y.

### PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works .... East Boston, Mass.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Fore River Shipbuilding Co.....Quincy, Mass.
Great Lakes Engineering Works.. Detroit.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co..... .....Newport News, Va.
Phosphor Bronze Smelting Co., Ltd..... ..... Philadelphia.
Roelker, H. B.....New York.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co....Superior, Wis.
Thropp & Sons Co., J. E.....Trenton, N. J.
Trout, H. G.....Buffalo.
United States Ship Building Co....New York.

### PROJECTORS, ELECTRIC.
General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co..... ..... Pittsburg, Pa.

### PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F., Mfg. Co.....New York.
Great Lakes Engineering Works Detroit.
Kingsford Foundry & Machine Works.... ..... Oswego, N. Y.

### PUNCHES, RIVETERS, SHEARS.
Allen, John F. .....New York.

### RANGES.
Russell & Watson .....Buffalo

### REFRIGERATING APPARATUS.
Great Lakes Engineering Works.....Detroit.
Roelker, H. B. .....New York.

### REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register .....Cleveland.
Record of American & Foreign Shipping.. .....New York.

### REPAIRS—ENGINE AND BOILER.
(See also Boiler Manufacturers and Engine Builders.)
Georgian Bay Engineering Works..... .....Midland, Ont.
Forest City Boiler Co.....Cleveland.

### RIVETING MACHINES.
Allen, John F.....New York.

### RIVETS, STEEL FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland, O.

### SAFETY VALVES.
American Steam Gauge & Valve Mfg. Co. ..... Boston.
Ashton Valve Co.....Boston.
Crane Co. .....Chicago.
Lunkenheimer Co. .....Cincinnati.

### SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby .....Boston.

### SALVAGE COMPANIES.
See Wrecking Companies.

### SCHOOLS—NAVIGATION.
Chicago Nautical School.....Chicago.

### SEARCH LIGHTS.
General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co..... .....Pittsburg, Pa.

### SHEARS.
See Punches, Rivets, and Shears.

### SHIP AND BOILER PLATES AND SHAPES.
Bourne Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.

### SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works .....East Boston, Mass.
Bertram Engine Works Co., Ltd.Toronto, Can.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Ship Building Co.....Detroit.
Fore River Shipbnilding Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Jenks Ship Building Co....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Manitowoc Dry Dock Co.....Manitowoc, Wis.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co..... .....Newport News, Va.
Roach's Ship Yard .....Chester, Pa.
Shipowner's Dry Dock Co.....Chicago.
Smith & Son, Abram.....Algonac, Mich.
United States Ship Building Co..New York.
Willard, Chas. P. & Co.....Chicago.

### SHIP CHANDLERS.
Baker, Howard H. & Co.. .....Buffalo.
Marine Mfg. & Supply Co.....New York.
Upson-Walton Co.....Cleveland.

### SHIP DESIGNERS.
Kidd, Joseph..... .....Duluth.
Kreer & Parsons. .....Chicago.
Matteson & Drake.....Buffalo.
Rice & Lovejoy.....Buffalo.
Steel, Nacey & Hynd.....Cleveland.
Wood, W. J.....Chicago.

### SHIP LANTERNS AND LAMPS.
Russell & Watson .....Buffalo.

### SHIP TIMBER.
Martin-Barriss Co.....Cleveland.

### SMOOTH-ON COMPOUND, FOR REPAIRS.
Smooth-On Mfg. Co.....Jersey City, N. J.

### STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co..Cuyahoga Falls, O.

### STEAM VESSELS FOR SALE.
Gilchrist & Co., C. P. .....Cleveland.
Holmes, Samuel .....New York.
Lester, S. S.....Quebec, Can.
McCarthy, T. R.....Montreal, Can.

### STEAMSHIP LINES, PASS. AND FREIGHT.
American Line .....New York.
Anchor Line .....Buffalo.
Boston Steamship Co.....Boston.
Cleveland & Buffalo Transit Co.....Cleveland.
Detroit & Cleveland Line.....Cleveland.
Erie & Western Trans. Co.....Buffalo.
Goodrich Trans. Co.....Chicago.
International Mercantile Marine Co..... ..... Philadelphia.
Manitou Steamship Co.....Chicago.
Mexican-American S. S. Co..New Orleans, La.
New York & Cuba Mail S. S. Co.....New York
Niagara, St. Catharines & Toronto Ry. & Nav. Co. .....St. Catharines, Ont.
Northern Michigan Trans. Co.....Chicago.
Red Star Line .....New York.
Richelieu & Ontario Nav. Co.....Montreal, Can.
United Fruit Co .....Boston.

### STEEL CASTINGS.
Macbeth Iron Co.....Cleveland.
Otis Steel Co.....Cleveland.

### STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Dake Engine Co.....Grand Haven, Mich.
Detroit Ship Building Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co....Port Huron, Mich.
Marine Mfg. & Supply Co.....New York.
Moulton Steering Engine Co.....New York.
Pawling & Harnischfeger .....Milwaukee.
Sheriffs Mfg. Co.....Milwaukee.

### SUBMARINE DIVING APPARATUS.
Morse & Son, A. J.....Boston.
Schrader's Son, A.....New York.

### SURVEYORS, MARINE.
Gaskin, Edward .....Buffalo.
Hynd, Alexander .....Cleveland.
Lovejoy, H. O.....Buffalo.
Matteson & Drake .....Philadelphia.
Parker Bros. Co., Ltd.....Detroit.
Nacey, James .....Cleveland.
Rice, Henry .....Buffalo.
Steel, Adam .....Cleveland.
Wood, W. J.....Chicago.

### TESTS OF MATERIALS.
Hunt, Robert W. & Co.....Chicago.
Pittsburg Testing Laboratory, Ltd....Pittsburg.

### TILING, INTERLOCKING RUBBER.
New York Belting & Packing Co...New York.

### TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Allen, John F.....New York.
Watson-Stillman Co.....New York.

### TOOLS, WOOD WORKING.
Atlantic Works, Inc.....Philadelphia.

### TOWING MACHINES.
American Ship Windlass Co..Providence, R. I.
Chase Machine Co.....Cleveland.

### TOWING COMPANIES.
Donnelly Salvage & Wrecking Co..... .....Kingston, Ont.
Great Lakes Towing Co.....Cleveland.
Midland Towing & Wrecking Co., Ltd.... .....Midland, Ont.

### TRAPS, STEAM.
Kieley & Mueller .....New York.
Lunkenheimer Co. .....Cincinnati.
Sturtevant Co., B. F., .....Hyde Park, Mass.

### TRUCKS.
Boston & Lockport Block Co.....Boston.

### TUBING, SEAMLESS.
Shelby Steel Tube Co.....Pittsburg, Pa.

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# Buyers' Directory of the Marine Trade.—*Continued.*

**VALVES, STEAM SPECIALTIES, ETC.**

American Steam Gauge & Valve Mfg. Co. ..... Boston.
Ashton Valve Co. ..... Boston.
Crane Co. ..... Chicago.
Jenkins Bros. ..... New York.
Kieley & Mueller ..... New York.
Lunkenheimer Co. ..... Cincinnati.
Ross Valve Co. ..... Troy, N. Y.

**VALVES FOR WATER AND GAS.**

Ross Valve Co. ..... Troy, N. Y.

**VARNISHES.**

Detroit Varnish Co. ..... Detroit.
Detroit White Lead Works ..... Detroit.
New Jersey Zinc Co. ..... New York.
Also Ship Chandlers.

**VENTILATING APPARATUS FOR SHIPS.**

Sturtevant, B. F. Co. ..... Hyde Park, Mass.

**VESSEL AND FREIGHT AGENTS.**

Boland, John J. ..... Buffalo.
Brown & Co. ..... Buffalo.
Elphicke, C. W. & Co. ..... Chicago.
Fleming & Co., P. H. ..... Chicago.
Gilchrist & Co., C. P. ..... Cleveland.
Hall & Root ..... Buffalo.
Helm & Co., D. T. ..... Duluth.

**VESSEL AND FREIGHT AGENTS—Con.**

Hawgood & Co., W. A. ..... Cleveland.
Holmes, Samuel ..... New York.
Hutchinson & Co. ..... Cleveland.
Lester, S. S. ..... Quebec, Can.
McCarthy, T. R. ..... Montreal.
Mitchell & Co. ..... Cleveland.
Parker Bros. Co., Ltd. ..... Detroit.
Prindiville & Co. ..... Chicago.
Richardson, W. C. ..... Cleveland.
Sullivan, D. & Co. ..... Chicago.

**WATER GAUGES.**

Bonner & Co., Wm. T. ..... Boston
Lunkenheimer Co. ..... Cincinnati, O.

**WIRE ROPE AND WIRE ROPE FITTINGS.**

Baker, H. H. & Co. ..... Buffalo.
DeGrauw, Aymar & Co. ..... New York.
Upson-Walton Co. ..... Cleveland.

**WHISTLES, STEAM.**

American Steam Gauge & Valve Mfg. Co. ..... Boston.
Ashton Valve Co. ..... Boston.
Lunkenheimer Co. ..... Cincinnati.

**WINDLASSES.**

American Ship Windlass Co. Providence, R. I.
American Ship Building Co. ..... Cleveland.
Hyde Windlass Co. ..... Bath, Me.
Jenks Ship Building Co. ..... Port Huron, Mich.
Marine Mfg. & Supply Co. ..... New York.

**WINCHES.**

American Ship Windlass Co. Providence, R. I.
Georgian Bay Engineering Works. ..... Midland, Ont.
Hyde Windlass Co. ..... Bath, Me.

**WOOD WORKING MACHINERY.**

Atlantic Works, Inc. ..... Philadelphia.

**WRECKING AND SALVAGE COMPANIES.**

Donnelly Salvage & Wrecking Co. ..... Kingston, Ont.
Great Lakes Towing Co. ..... Cleveland.
Midland Towing & Wrecking Co., Ltd. ..... Midland, Ont.
Parker Bros. Co., Ltd. ..... Detroit.

**YACHT AND BOAT BUILDERS.**

Bertram Engine Works Co., Ltd. Toronto, Can.
Drein, Thos. & Son ..... Wilmington, Del.
Georgian Bay Engineering Works. ..... Midland, Ont.
Truscott Boat Mfg. Co. ..... St. Joseph, Mich.
Willard, Chas. P. & Co. ..... Chicago.

**YAWLS.**

Drein, Thos. & Son ..... Wilmington, Del.

# ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.
The dagger (†) indicates that advertisement appears once a month.


*Allen, John F. ..... 3
Almy Water Tube Boiler Co ..... 42
American Bureau of Shipping ..... 44
American Injector Co ..... 3
American Line ..... 39
American Ship Building Co ..... 5
American Ship Windlass Co ..... 2
American Steam Gauge Co ..... 35
Anchor Line ..... 39
Armstrong Cork Co ..... 56
Ashton Valve Co ..... 35
Atlantic Works ..... 41
†Atlantic Works, Inc ..... 8

Babcock & Wilcox Co ..... 8
Baldt Anchor Co ..... 55
Baker, Howard H., & Co. ..... 56
*Bertram Engine Works Co. Ltd. ..... 41
Blake, Geo. F., Mfg. Co ..... 45
Boland, J. J ..... 48
*Bonner & Co., Wm. T ..... 35
*Boston & Lockport Block Co ..... 39
Boston Steamship Co. ..... 2
Bourne-Fuller Co. ..... 35
Bowers, L. M., & Co ..... 55
Brown Hoisting Machinery Co., Inc ..... 2
Buffalo Dredging Co ..... 46
Buffalo Dry Dock Co ..... 4

†Camden Anchor-Rockland Machine Co ..... 6
Chase Machine Co ..... 46
Chicago & Gt. L. Dredge & Dock Co ..... 41
Chicago Nautical School ..... 4
Chicago Ship Building Co ..... 55
Cleveland City Forge & Iron Co. ..... 38
Cleveland & Buffalo Transit Co. ..... 2
Continental Iron Works ..... 9
Contractors' Supply & Equipment Co ..... 54
Cory, Chas. & Son ..... 5
*Craig Ship Building Co ..... 41
Cramp, Wm. & Sons, S. & E. B. Co ..... 3
*Crandall & Son, H. I. ..... 43-44
Crane Co ..... 43-44

D & C. Line ..... 38
Dake Engine Co ..... 42
Dearborn Drug & Chemical Wks ..... 6
DeGrauw, Aymar & Co ..... 47
Delanney, Belleville & Co ..... 35
Delaware River Iron S. B. & E. Works ..... 41
Detroit Ship Building Co ..... 5
Dixon Crucible Co., Joseph ..... 54
Donnelly Salvage & Wrecking Co ..... 44
Drein, Thos., & Son ..... 40
Dunbar & Sullivan Dredging Co. ..... 46

Elphicke, C. W., & Co ..... 48
Erie & Western Trans. Co ..... 38

Falls Hollow Staybolt Co ..... 47
Fisher Electrical Works ..... 40
Fitz-Simons & Connell Co ..... 46
Fix's, S., Sons ..... 54
Fleming & Co., P. H ..... 48
Fletcher, W. & A., Co ..... 41
Fogg, M. W ..... 2
Fore River Shipbuilding Co ..... 41
Forest City Boiler Co ..... 54
Frankfort M. A. & P. G. I. Co ..... 44

General Electric Co. ..... 56
*Georgian Bay Engineering Wks. ..... 41
Gilchrist, Albert J ..... 48
Gilchrist & Co., C. P. ..... 48
Goodrich Trans. Co ..... 38
Goulder, Holding & Masten ..... 48
Great Lakes Engineering Works ..... 12
Great Lakes Register ..... 52
*Great Lakes Towing Co ..... 5

Hall & Root ..... 48
Hanna, M. A., & Co. ..... 47
Hawgood & Co., W. A ..... 48
Helm & Co., D. T ..... 48
Hickler Bros ..... 46
Holmes, Samuel ..... 48
Holzapfel's American Compositions Co. ..... 45
Hoyt, Dustin & Kelley ..... 48
Hunt, Robert W., & Co. ..... 49
Hutchinson & Co ..... 48
Hyde Windlass Co ..... 56
Hynd, Alexander ..... 49

International Mercantile Marine Co ..... 39
Ironville Dock & Coal Co. ..... 47

Jenkins Brothers ..... 56
Jenks Ship Building Co. ..... 5

Kahnweiler's Sons, David ..... 40
Katzenstein, L., & Co. ..... 40
Kidd, Joseph ..... 49
*Kieley & Mueller ..... 35
Kingsford Foundry & Machine Works ..... 42
Kreer & Parsons ..... 49
Kremer, C. E. ..... 48

Lake Superior Contracting & Dredging Co. ..... 46
Lebanon Chain Works ..... 54
Le Mois Scientifique et Industrial ..... 42
Lester, S. S. ..... 48
Lockwood Mfg. Co ..... 41
Lovejoy, H. O ..... 49
L. S. & M. S. Ry. ..... 55
Lunkenheimer Co ..... 54

McCarthy, T. R ..... 48
McCurdy, Geo. L ..... 44
†McNab & Harlin Mfg. Co ..... 56
Macbeth Iron Co ..... 49
MacDonald, Ray G ..... 41
Manitowoc Dry Dock Co ..... 38
Manitou Steamship Co ..... 47
Marine Iron Co., Bay City, Mich. ..... 40
*Marine Mfg. & Supply Co ..... 43
Martin-Barriss Co ..... 40-49
Matteson & Drake ..... 38
Mexican-American S. S. Co ..... 55
Midland Towing & Wrecking Co., Ltd ..... 6
Mietz, Aug ..... 4
Milwaukee Dry Dock Co ..... 48
Mitchell & Co ..... 54
Morse & Son, A. J ..... 43
Mosher Water-Tube Boiler Co ..... 43
Motor Boat and Sportsman's Show ..... 42
Moulton Steering Engine Co ..... 49

Nacey, James ..... 7
Newport News Ship Building & Dry Dock Co ..... 6
New Jersey Zinc Co ..... 3
New York Belting & Packing Co. ..... 39
New York & Cuba Mail S. S. Co. ..... 38
Niagara, St. C. & T. Ry. & N. Co. ..... 38
Northern Mich. Trans. Co ..... 42
Northwestern Steam Boiler & Mfg. Co ..... 3

Otis Steel Co ..... 48

Parker Bros. Co ..... 42
Pawling & Harnischfeger ..... 44
Peck, Chas. E. & W. F ..... 8
*Penberthy Injector Co. ..... 40
Phosphor Bronze Smelting Co., Ltd ..... 47
Pickands, Mather & Co ..... 9
Pittsburg Coal Co ..... 49
Pittsburg Testing Laboratory, Ltd ..... 49
Potter & Potter ..... 40
Potter, J. D ..... 49
Powell, Ambrose V ..... 48
Prindiville & Co. ..... 44

Record of American & Foreign Shipping ..... 8
Red Star Line ..... 39
†Reilly, Repair and Supply Co., Jas., ..... 40
Reliance Mfg. Co. ..... 49
Rice, Henry ..... 48
Richardson, W. C ..... 47
*Ritchie & Sons, E. S ..... 6
Roberts Water-Tube Boiler Co. ..... 41
Roelker, H. B ..... 54
Ross Valve Co ..... 45
Russell & Watson ..... 49

Sadler, Perkins & Field ..... 8
Safety Car Heating & Lighting Co ..... 45
Scherzer Rolling Lift Bridge Co. ..... 49
Schrader's Sons, A ..... 8
Shaw, Warren, Cady & Oakes ..... 8
*Shelby Steel Tube Co ..... 37
Sheriffs Mfg. Co ..... 41
Shipowners' Dry Dock Co ..... 45
Shipping World ..... 47
*Smith & Son, Abram ..... 46
Smith Co., L. P. & J. A. ..... 9
Smith Coal & Dock Co., Stanley B ..... 45
Smith Premier Typewriter Co. ..... 9
Smith, Stanley B., & Co ..... 37
Smooth-On Mfg. Co ..... 2
*Standard Gauge Mfg. Co. ..... 55
*Standard Oil Co ..... 46
Starke Dredge & Dock Co., C. H. ..... 49
Steel, Adam ..... 9
Stirling Co. ..... 2
Stratford Oakum Co., Geo ..... 56
Sturtevant, B. F., Co ..... 47
Sullivan, M. ..... 48
Sullivan & Co ..... 4
Superior Ship Building Co ..... 43

Taylor Water-Tube Boiler Co ..... 43
†Temple Pump Co. ..... 54
Thropp, J. E., & Sons Co ..... 37
Trout, H. G ..... 40
Truscott Boat Mfg. Co ..... 47

Union Machine & Boiler Co ..... 38
United Fruit Co. ..... 56
Upson-Walton Co. ..... 2

Victor Metals Co ..... 35

Walker, Thomas, & Son ..... 39
Ward Line ..... 55
*Watson-Stillman Co ..... 43
Westinghouse Electric & Mfg. Co. ..... 48
White, Johnson, McCaslin & Cannon ..... 35
*Willard, Chas. P., & Co. ..... 49
Wood, W. J. ..... 49


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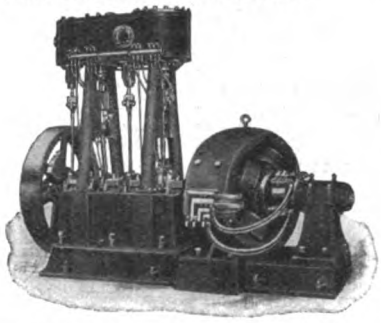

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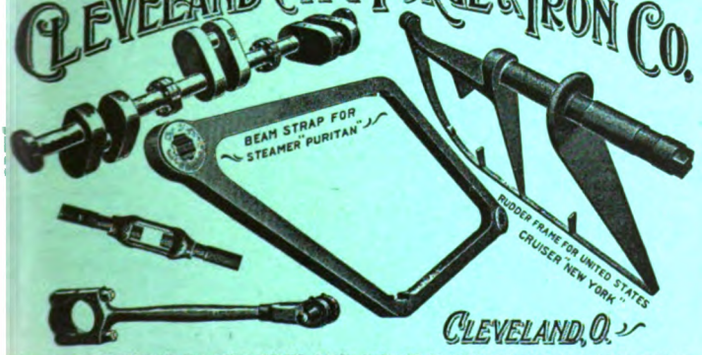


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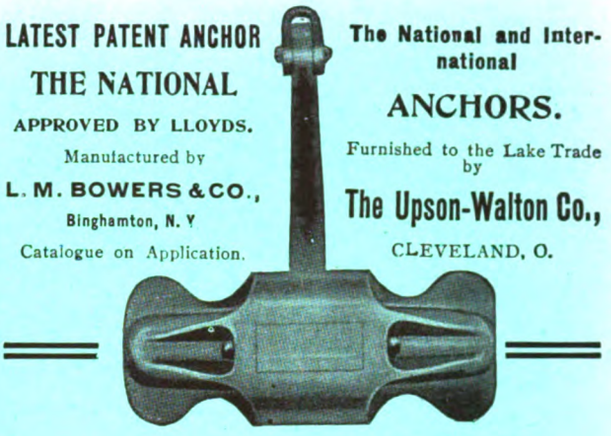

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| Eastward | Arrive from West | Depart East |
|---|---|---|
| No. 18, Southwestern Limited | ..... | *1:50 a.m. |
| No. 22, Lake Shore Limited | *2:12 a.m. | *2:20 a.m. |
| No. 20, Chicago and Cleveland Exp. | *7:20 a.m. | ..... |
| No. 28, New York and Boston Exp. | *7:40 a.m. | *8:00 a.m. |
| No. 40, Toledo and Buffalo Accom | †10:00 a.m. | †10:30 a.m. |
| No. 32, Fast Mail | *11:25 a.m. | *11:30 a.m. |
| No. 48, Accommodation via Sandusky | †1:40 p.m. | ..... |
| No. 42, Boston-New York Express | ..... | *11:45 a.m. |
| No 44, Cleveland and New York Spl | ..... | *3:00 p.m. |
| No. 46 Southwestern Express | ..... | *3:10 p.m. |
| No. 116, Ashtabula Accommodation | ..... | †4:30 p.m. |
| No. 6, Limited Fast Mail | *5:40 p.m. | *5:45 p.m. |
| No. 26, 20th Century Limited | *7:40 p.m. | *7:43 p.m. |
| No. 10, Chicago, N.Y. & Boston Spl. | *7:30 p.m. | *7:50 p.m. |
| No. 16, New England Express | *10:30 p.m. | *10:35 p.m. |
| No. 2, Day Express | †9:10 p.m. | †9:25 p.m. |
| No. 126, Norwalk Accommodation | †7:55 a.m. | ..... |

| Westward | Arrive from East | Depart West |
|---|---|---|
| No. 7, Exposition Limited | *12:50 a.m. | ..... |
| No. 11, Southwestern Limited | *2:55 a.m. | ..... |
| No 9, Day Express | ..... | †6:10 a.m. |
| No. 15, Boston and Chicago Special | *3:10 a.m. | *3:15 a.m. |
| No. 19, Lake Shore Limited | *7:15 a.m. | *7:25 a.m. |
| No. 23, Western Express | *10:30 a.m. | *10:35 a.m. |
| No. 29, Southwestern Special | ‡11:10 a.m. | ..... |
| No 33, Southwestern Express | *12:25 p.m. | ..... |
| No. 133, Cleveland and Detroit Exp. | ..... | *12:45 p.m. |
| No. 47, Accommodation | †11:00 a.m. | †3:00 p.m. |
| No. 141, Sandusky Accommodation | ..... | †3:10 p.m. |
| No. 43, Fast Mail | *4:35 p.m. | *4:40 p.m. |
| No. 127, Norwalk Accommodation | ..... | †5:10 p.m. |
| No. 37, Pacific Express | *6:50 p.m. | *7:20 p.m. |
| No. 3, Fast Mail Limited | *10.50 p.m. | *10:55 p.m. |
| No 115, Ashtabula Accommodation | *8.30 a.m. | ..... |

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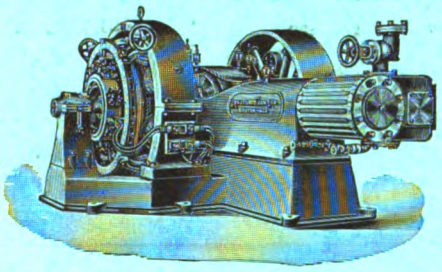

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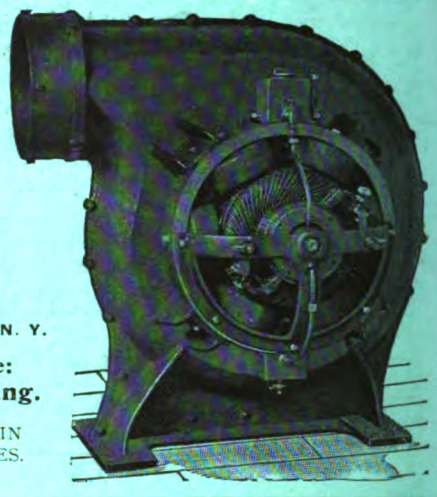

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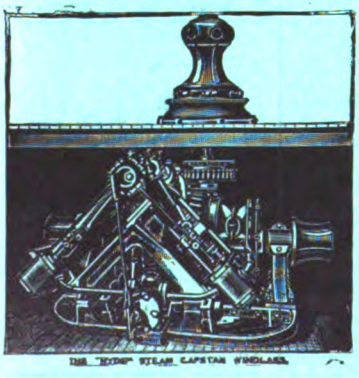

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